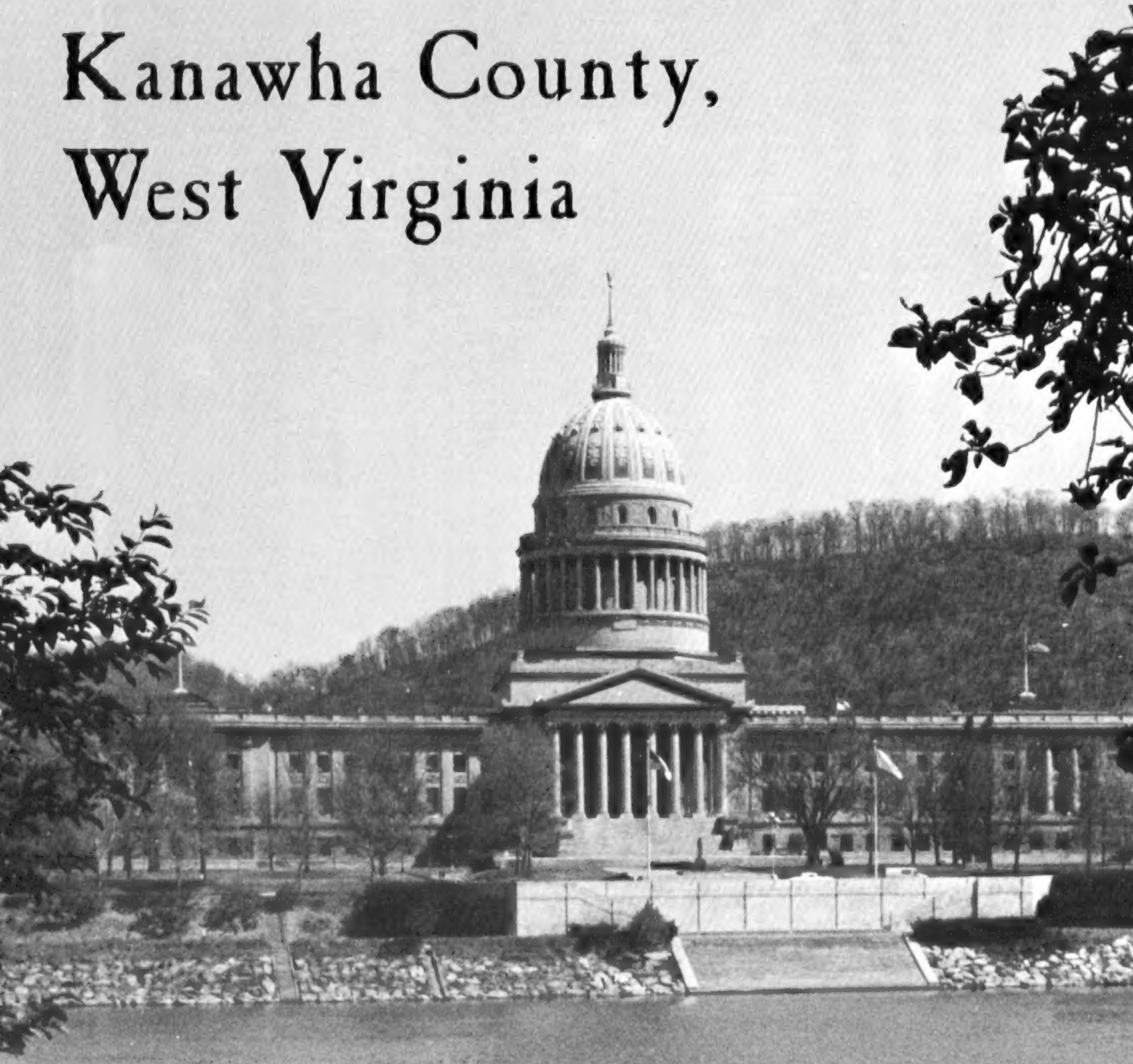
SOIL SURVEY OF

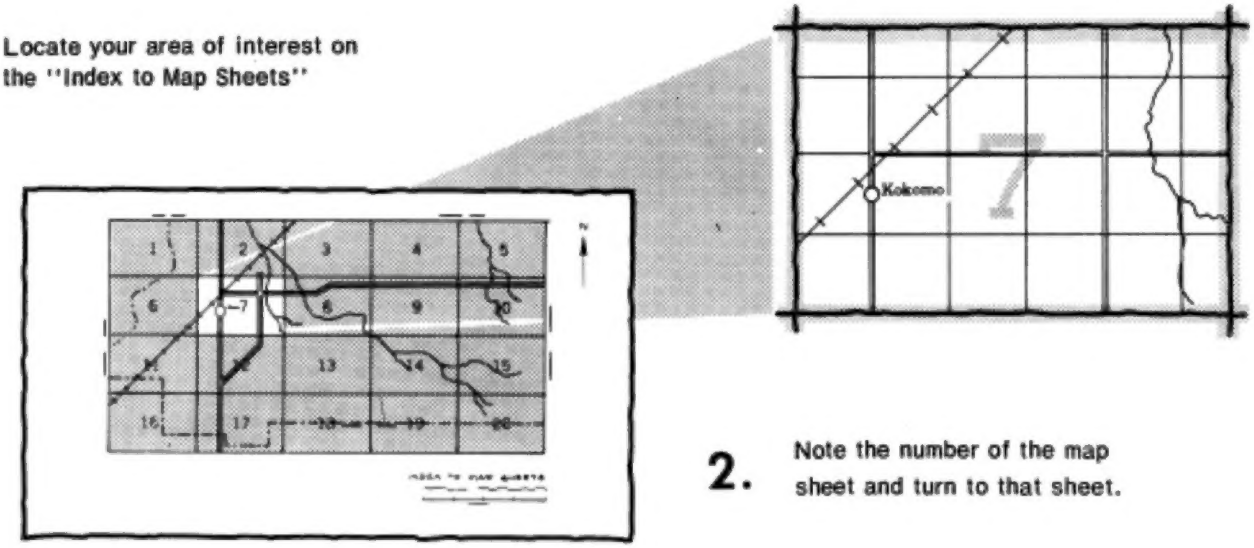
Kanawha County, West Virginia



U.S. Department of Agriculture, Soil Conservation Service,
in cooperation with the
West Virginia University Agricultural Experiment Station and the Kanawha County Commission

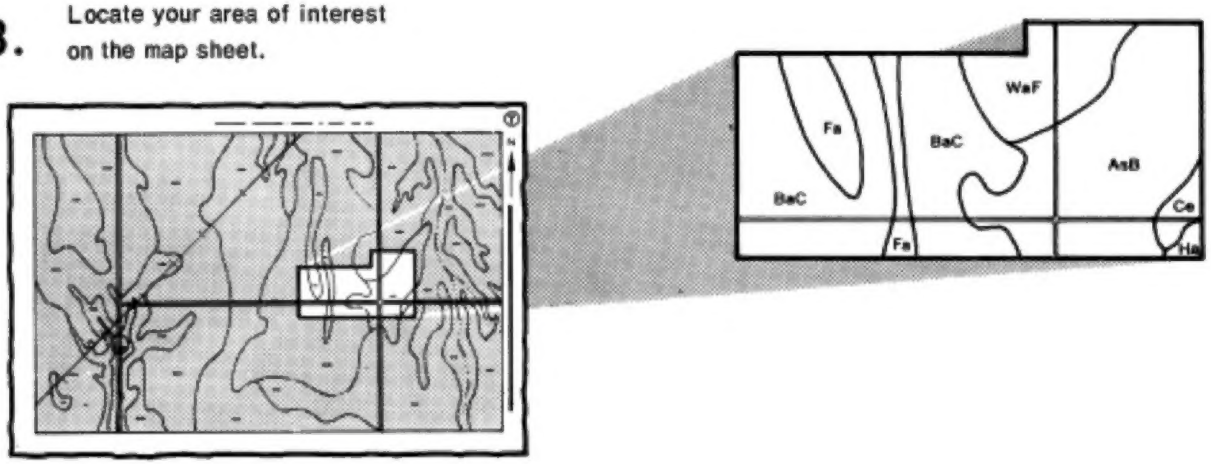
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

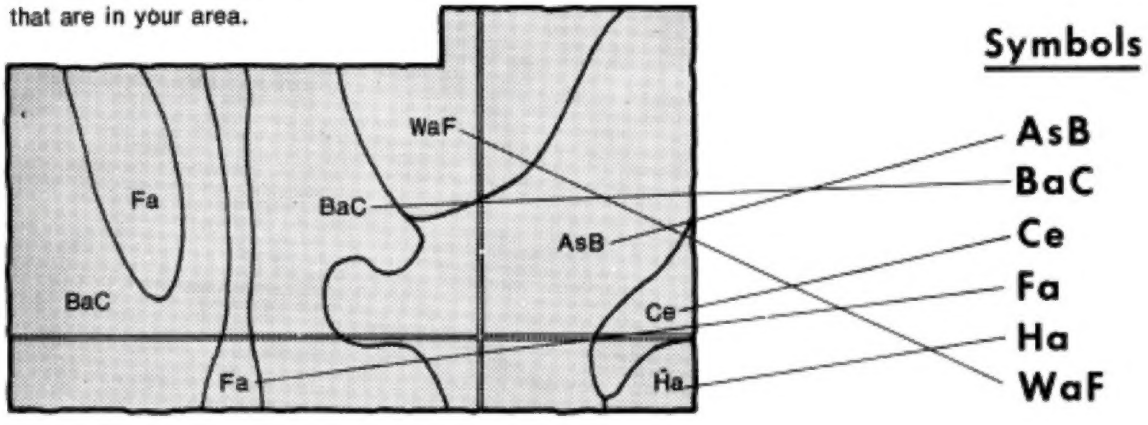


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

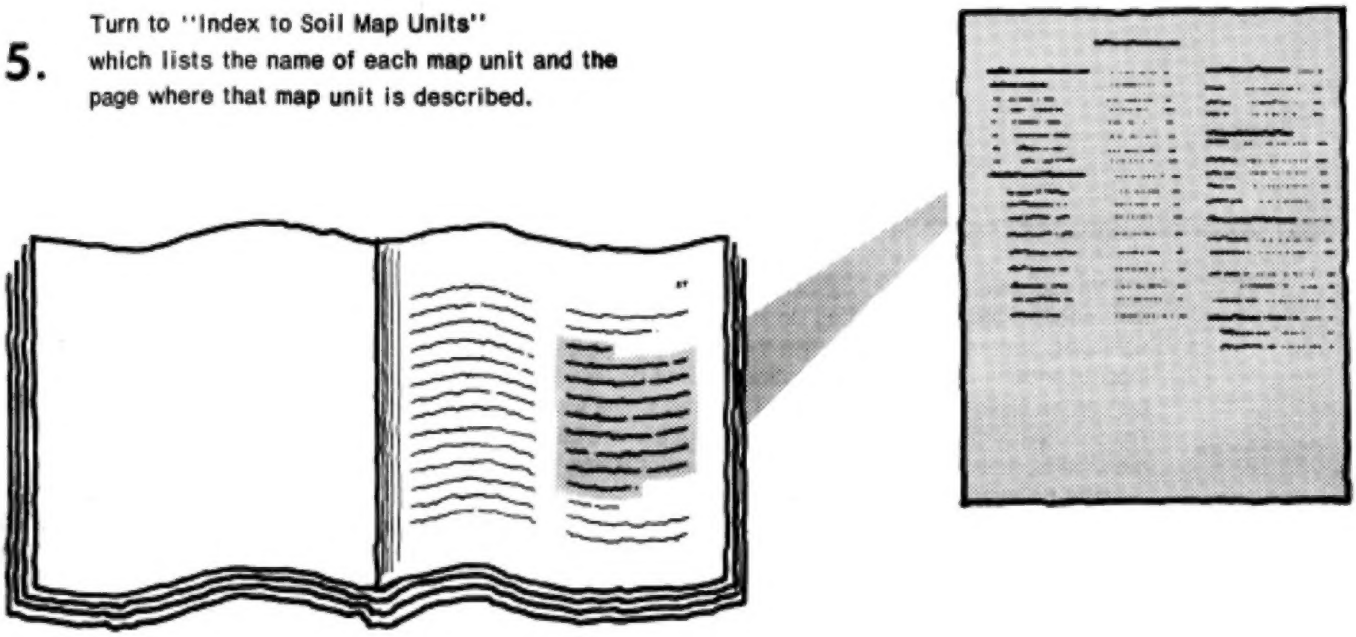


4. List the map unit symbols that are in your area.

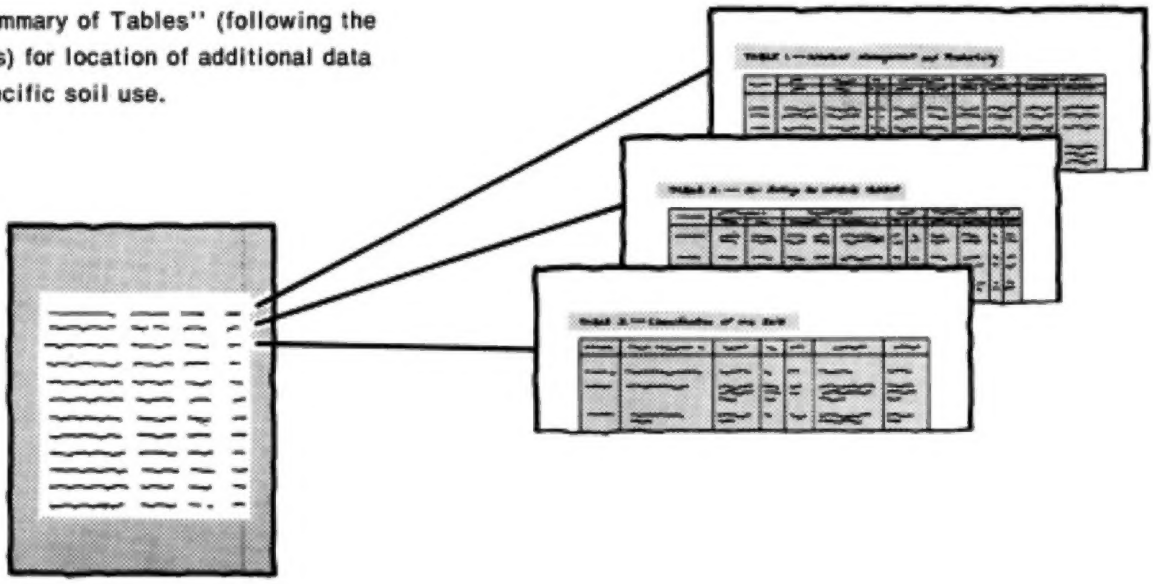


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1967-75. Soil names and descriptions were approved in 1976. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1976. This survey was made cooperatively by the Soil Conservation Service, the West Virginia University Agricultural Experiment Station, and the Kanawha County Commission. It is part of the technical assistance furnished to the Capitol Soil Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: Capitol Building of West Virginia on north side of Kanawha River in Charleston. The building is on Kanawha fine sandy loam in an area of Urban land.

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Issued October 1981

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Foreword

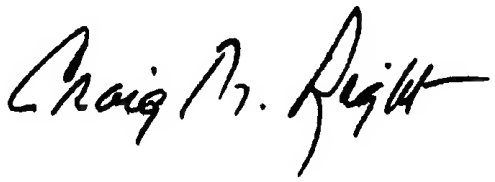
The Soil Survey of Kanawha County, West Virginia, contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

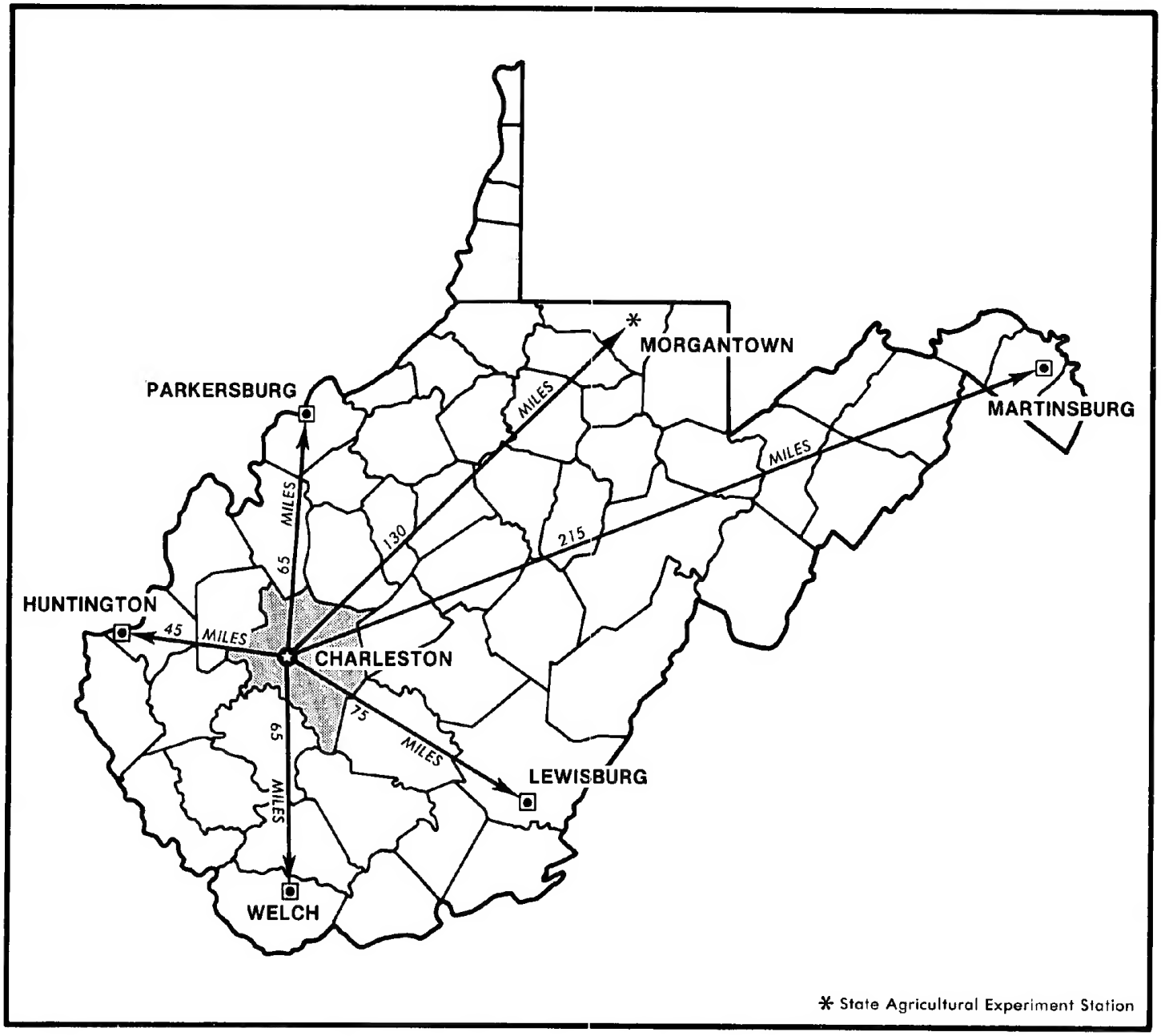
Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.



Craig M. Right
State Conservationist
Soil Conservation Service



Location of Kanawha County in West Virginia.

SOIL SURVEY OF KANAWHA COUNTY, WEST VIRGINIA

By David G. Van Houten, Francis D. Childs, Charles C. Teets, Ronald Estepp, and Frank A. Doonan, Soil Conservation Service

U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the West Virginia University Agricultural Experiment Station and the Kanawha County Commission

KANAWHA COUNTY is in the west-central part of West Virginia. The Kanawha River flows through the county from the southeast to the northwest. About two-thirds of the county is north of the River, and one-third is to the south. The Elk River flows into Kanawha County from the northeast and dissects the portion of the county north of Kanawha River. The county has a total of 581,100 acres, or 908 square miles, of which 3,734 acres is water and 15,502 acres is in urban or industrial areas. Most of the county is mountainous, but the northwestern part has less relief and more gentle slopes than the southern part, which is almost entirely mountainous.

General nature of the county

This section provides general information about Kanawha County. It discusses settlement and population, farming, transportation and industry, relief and drainage, and climate.

Settlement and population

The first settlement in what is now Kanawha County was in 1774, when a family homesteaded an area near the confluence of Kellys Creek and the Kanawha River. In 1788 Fort Lee was established and the Virginia Legislature established Kanawha County. In 1794 Charlestown (shortened to Charleston in 1889) was incorporated by the Virginia Assembly.

In the 1790's, farming and an interest in the salt resources of the county created an increase in land purchases and settlement. The salt industry helped to establish other businesses and began the industrial development of the area.

Kanawha County has a population of 229,515. The majority of the population is in the valley along the Kanawha River. Charleston is the county seat of Kanawha County and the capital of West Virginia. It has a population of 71,505.

Farming

According to the 1974 census of Agriculture, there were 218 farms in Kanawha County and a total farm acreage of 23,064. The average size was 106 acres.

Farmland makes up about 4 percent of the total area of the county. Harvested cropland accounts for 9 percent of the farmland; woodland, woodland pastures, and areas put to miscellaneous use make up the remaining 91 percent. Most of the farmland is on the flood plains, terraces, and less sloping uplands.

Farming and the acreage used for farming have declined because of an increase in urbanization of the county (fig. 1). Farm enterprises such as dairy and poultry production have practically ceased in Kanawha County. Beef cattle and vegetable gardening account for much of the farming activity remaining in the county. Much of the farming is done on a part-time basis by those who live or work in urban areas.

Transportation and industry

Kanawha County is served by interstate, state, and county roads; railroads; airports; and barges.

Three interstate highways cross Charleston: Interstate 64, Interstate 77, and Interstate 79. Other major automotive routes in the county are the West Virginia Turnpike; Federal highways 21, 35, 60, and 119; and State routes 4, 25, 61, 62, 114, and 214.

Two major railroads serve the county. They are adjacent to the Kanawha River and join spurs to the parts of the county where coal mining occurs.

Kanawha County is served by five major airlines. The Kanawha County Airport was built after World War II. It is north of Charleston and south of Elk River.

Barges use the Kanawha River to transport coal and other raw materials and refined petroleum. Locks built in the late nineteenth century provide river transportation from Montgomery to the Ohio River at Point Pleasant in Mason County.

The first industries in the county included the production of salt, tin and copper products, and wagons and barrels. Some of the major industries in the county are coal mining and the production of oil, natural gas, chemicals, and synthetics for the plastics and paint industries.

Relief and drainage

Kanawha County is part of a highly dissected plateau that is characterized by ridges and steep hillsides. The hillsides are broken by a system of benches. Kanawha County is drained by the Kanawha River and its tributaries. The Kanawha River and its southern tributaries flow in a north-to-northwest direction, and the northern tributaries flow toward the southwest.

The elevation of the county ranges from 566 feet at the water level of the Kanawha River near Nitro to 2,898 feet near the Kanawha-Raleigh county line. Hills are approximately 1,000 feet high and very steep in the eastern and southern parts of the county, and they are less than 500 feet high and steep to strongly sloping in the northern and western parts of the county.

The elevation of the Kanawha River is 614 feet at its point of entry at the southeastern side of the county, near Montgomery. At the point where the Elk River enters Kanawha County to the northeast, the elevation is approximately 630 feet. The elevation of the Coal River is approximately 625 feet just south of Alum Creek, where it enters the western part of the county.

Climate

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Charleston, West Virginia, for the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 36 degrees F, and the average daily minimum temperature is 27 degrees. The lowest temperature on record, which occurred at Charleston on January 24, 1963, is -12 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 102 degrees.

Growing degree days, shown in table 1, are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 22 inches, or 54 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 5.60 inches at Charleston on July 19, 1961. Thunderstorms occur on about 43 days each year, and most occur in summer.

Average seasonal snowfall is 30 inches. The greatest snow depth at any one time during the period of record was 12 inches. On the average, 11 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 50 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The prevailing wind is from the southwest. Average windspeed is highest, 9 miles per hour, in March.

Climatic data in this section were specially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of

different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, map units that have a distinct pattern of soils and of relief and drainage. Each map unit is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

The names of the map units on the general soil map of Kanawha County do not in all instances agree with those of adjacent map units on the general soil map of the soil survey of Fayette and Raleigh Counties. The differences in names of adjoining units are a result of improvements in the classification of the soils, differences in the pattern of occurrence of the major soils in the adjoining units, and variations in the material in which the soils formed.

1. Urban land-Kanawha

Urban land and nearly level and gently sloping, well drained, lime-influenced soils; on high flood plains

This map unit consists of Urban land and soils on flood plains along the Kanawha and Coal Rivers.

This map unit makes up about 3 percent of the county. It is about 44 percent Urban land, 11 percent Kanawha soils, and 45 percent minor soils and water.

Urban land consists of areas that are covered by streets, highways, parking lots, buildings, industrial complexes, and other structures of urban areas. Urban land is mapped with Fluvaquents, with Kanawha soils, and with Tyler soils in some areas.

Kanawha soils are deep. They formed in lime-influenced alluvial material washed from uplands underlain by interbedded shale, siltstone, and sandstone. Kanawha soils have a dark brown, moderately coarse textured surface layer and a dark yellowish brown to dark brown, moderately coarse textured to medium textured subsoil. Kanawha soils are mapped with Urban land in some areas. They are rarely flooded.

The minor soils in this map unit are mostly somewhat poorly drained Tyler soils and moderately well drained Cotaco soils on terraces; excessively drained to moderately well drained Udifluvents, loamy, somewhat poorly drained and poorly drained Fluvaquents, and moderately well drained Senecaville soils on flood plains; and well drained Laidig soils on foot slopes.

The major part of the urban development of the county is on the soils within this map unit (fig. 2). The flood hazard of these soils is the major limitation for nonfarm uses.

2. Kanawha-Hackers

Nearly level and gently sloping, well drained, lime-influenced soils; on high flood plains

This map unit consists of soils adjacent to the Elk River and Big Sandy Creek. These soils are rarely flooded.

This map unit makes up less than 1 percent of the county. It is about 26 percent Kanawha soils, 11 percent Hackers soils, and 63 percent minor soils and water.

Kanawha soils are deep. They formed in lime-influenced alluvial material washed from soils on uplands underlain by interbedded shale, siltstone, and sandstone. Kanawha soils have a dark brown, moderately coarse textured surface layer and a dark yellowish brown to dark brown, moderately coarse textured to medium textured subsoil.

Hackers soils are deep. They formed in lime-influenced alluvial material washed from soils on uplands underlain by shale, siltstone, and sandstone. Hackers soils have a dark brown, medium textured surface layer and a reddish brown to yellowish red, medium textured to moderately fine textured subsoil.

The minor soils in this map unit are mostly moderately well drained Cotaco soils on terraces; well drained Vandalia and Laidig soils on foot slopes; and well drained Moshannon soils and excessively drained to moderately well drained Udifluvents, loamy, on flood plains.

This unit is used mainly for urban development. The flood hazard is the main limitation for nonfarm uses.

3. Senecaville-Hackers-Vandalia

Nearly level to moderately steep, well drained and moderately well drained, lime-influenced soils; on flood plains and foot slopes

This map unit consists of soils in the northwestern part of the county adjacent to the Pocatalico River.

This map unit makes up less than 1 percent of the county. It is about 25 percent Senecaville soils, 20 percent Hackers soils, 20 percent Vandalia soils, and 35 percent minor soils and water.

Senecaville soils are deep, moderately well drained, and nearly level. They are on flood plains. They formed in lime-influenced alluvial material washed from soils on uplands underlain by shale, siltstone, and sandstone. Senecaville soils have a brown to dark brown, medium textured surface layer and a reddish brown, medium textured subsoil that is mottled in the lower part. Senecaville soils have a seasonal high water table. They are commonly flooded, but the areas on high flood plains near the Hackers soils flood less frequently.

Hackers soils are deep, well drained, and nearly level to gently sloping. They are on high flood plains. They formed in lime-influenced alluvial material washed from soils on uplands underlain by shale, siltstone, and sandstone. Hackers soils have a dark brown, medium textured surface layer and a reddish brown to yellowish red, medium textured to moderately fine textured subsoil. Hackers soils are rarely flooded.

Vandalia soils are deep, well drained, and gently sloping to steep and are on foot slopes. They formed in lime-influenced colluvial material which moved down slope, mainly from soils of the Gilpin-Upshur complex. Vandalia soils have a dark reddish brown, medium textured or moderately fine textured surface layer and a reddish brown fine textured subsoil that is shaly or channery in the lower part. Vandalia soils are subject to slipping.

The minor soils in this map unit are well drained Moshannon soils on the flood plains; well drained Gilpin and Upshur soils on uplands; well drained Allegheny soils, well drained to moderately well drained Vincent soils, and moderately well drained Monongahela and Cotaco soils on terraces; and somewhat poorly drained and poorly drained Fluvaquents on flood plains.

This unit is mostly cleared and used mainly for hay or cultivated crops. The foot slopes are mostly in hay or pasture.

Slope, permeability, depth to seasonal high water table, flood hazard, shrink-swell potential, and the slip hazard are the major limitations for nonfarm uses.

4. Gilpin-Upshur-Vincent

Gently sloping to very steep, well drained and moderately well drained, acid soils and lime-influenced soils; on uplands and old slackwater terraces

This map unit consists of soils in the Cross Lanes area. The Gilpin and Upshur soils are intermingled and are commonly mapped together.

This map unit makes up less than 1 percent of the county. It is about 22 percent Gilpin soils, 16 percent Upshur soils, 15 percent Vincent soils, and 47 percent minor soils.

Gilpin soils are moderately deep, well drained, and strongly sloping to very steep. They are on uplands. They formed in acid material weathered from interbedded shale, siltstone, and sandstone. Gilpin soils have a dark grayish brown and dark brown to brown, medium textured surface layer and a yellowish brown to strong brown, medium textured to moderately fine textured subsoil that is channery in the lower part.

Upshur soils are moderately deep and deep, well drained, and strongly sloping to very steep. They are on uplands. They formed in lime-influenced material weathered from red shale. Upshur soils have a reddish brown, medium textured or moderately fine textured surface layer and a dark reddish brown to dark red fine textured subsoil. They are subject to slipping.

Vincent soils are deep, well drained or moderately well drained, and gently sloping to strongly sloping. They are on slackwater terraces. They formed in lime-influenced alluvial material deposited by slackwater and washed from soils on uplands underlain by shale, siltstone, and sandstone. Vincent soils have a brown to dark brown, medium textured or moderately fine textured surface layer and a strong brown to yellowish red and reddish brown, moderately fine textured and fine textured subsoil that is mottled in the lower part. They have a seasonal high water table.

The minor soils in the map unit are well drained Vandalia soils on foot slopes, well drained Allegheny soils and moderately well drained Monongahela soils on high terraces, and well drained Moshannon soils and moderately well drained Senecaville soils on flood plains.

Most of this unit was cleared and farmed. Much of the area is used for homesites. The soils on the narrow flood plains are subject to flooding.

Slope, permeability, seasonal high water table, depth to bedrock, shrink-swell potential, the slip hazard, and flooding hazard are the main limitations for nonfarm uses.

5. Gilpin-Upshur-Vandalia

Gently sloping to very steep, well drained, acid soils and lime-influenced soils; on uplands and foot slopes

This map unit consists of soils in the northwestern part of the county. Rock outcrops are common in some areas. The Gilpin and Upshur soils are intermingled and are commonly mapped together.

This map unit makes up about 34 percent of the county. It is about 50 percent Gilpin soils, 22 percent Upshur soils, 5 percent Vandalia soils, and 23 percent minor soils.

Gilpin soils are moderately deep and gently sloping to very steep. They are on uplands. They formed in acid material weathered from interbedded shale, siltstone, and sandstone. Gilpin soils have a dark grayish brown and dark brown to brown, medium textured surface layer and

a yellowish brown to strong brown, medium textured to moderately fine textured subsoil that is channery or shaly in the lower part.

Upshur soils are moderately deep and deep and are gently sloping to very steep. They are on uplands. They formed in lime-influenced material weathered from red shale. Upshur soils have a reddish brown, medium textured or moderately fine textured surface layer and a dark reddish brown to dark red, fine textured subsoil. Upshur soils are susceptible to slipping.

Vandalia soils are deep and gently sloping to steep. They are on foot slopes. They formed in lime-influenced colluvial material which moved down slope mainly from soils of the Gilpin-Upshur complex. Vandalia soils have a dark reddish brown, medium textured or moderately fine textured surface layer and a reddish brown, fine textured subsoil that is shaly or channery in the lower part. Vandalia soils are susceptible to slipping.

The minor soils in this map unit are mostly well drained Clymer and Dekalb soils on uplands and well drained Moshannon and Sensabaugh soils and moderately well drained Senecaville soils on narrow flood plains.

Much of this unit has been cleared and is used for pasture or hay. Many of the steeper and less accessible soils are idle or have reverted to trees. The soils on the narrow flood plains are subject to flooding.

Slope, permeability, depth to bedrock, shrink-swell potential, the slip hazard, and flooding are the main limitations for nonfarm uses.

6. Clymer-Gilpin-Dekalb

Strongly sloping to very steep, well drained, acid soils; on uplands

This map unit consists of areas of soils south of the Elk River. Rock outcrops are common in some areas, and some areas have a very stony surface. The Clymer and Dekalb soils are intermingled and are mapped together.

This map unit makes up about 11 percent of the county. It is about 22 percent Clymer soils, 22 percent Gilpin soils, 16 percent Dekalb soils, and 40 percent minor soils.

Clymer soils are deep and strongly sloping to very steep. They are on uplands. They formed in acid material weathered from sandstone, siltstone, and interbedded shale. Clymer soils have a very dark grayish brown to yellowish brown, medium textured surface layer that is channery and have a yellowish brown to strong brown, medium textured to moderately fine textured subsoil that is channery.

Gilpin soils are moderately deep and strongly sloping to very steep. They are on uplands. They formed in acid material weathered from interbedded shale, siltstone, and sandstone. Gilpin soils have a dark grayish brown and dark brown to brown, medium textured surface layer and have a yellowish brown to strong brown, medium textured to moderately fine textured subsoil that is channery or shaly in the lower part.

Dekalb soils are moderately deep and moderately steep to very steep. They are on rough uplands. They formed in acid material weathered from sandstone interbedded with siltstone and shale. Dekalb soils have a black to brown, moderately coarse textured surface layer that is channery and a pale brown, moderately coarse textured subsoil that is channery and very channery.

The minor soils in this map unit are well drained Upshur soils on uplands; well drained Laidig soils on foot slopes; and excessively drained to somewhat poorly drained Udifluvents, gravelly, and Udifluvents, loamy, on narrow flood plains.

Some of the broader ridgetops, less sloping hillsides, and flood plains were cleared and farmed. The steeper hillsides are wooded. Most of the areas that were farmed are idle or have reverted to trees. The soils on narrow flood plains are subject to flooding.

Slope, depth to bedrock, slow permeability, the slip hazard, shrink-swell potential, and the flooding hazard limit these soils for nonfarm uses.

7. Clymer-Dekalb-Gilpin

Strongly sloping to very steep, well drained, acid soils; on rugged uplands

This map unit consists of soils in the southeastern part of the county. It is the most rugged part of the county. Rock outcrops are common in some areas. The Clymer and Dekalb soils are intermingled and are mapped together. In some areas they have a very stony surface.

This map unit makes up about 50 percent of the county. It is about 33 percent Clymer soils, 28 percent Dekalb soils, 8 percent Gilpin soils, and 31 percent minor soils.

Clymer soils are deep and strongly sloping to very steep. They are on uplands. They formed in acid material weathered from sandstone, siltstone, and interbedded shale. Clymer soils have a very dark grayish brown to yellowish brown, medium textured surface layer that is channery and a yellowish brown to strong brown, medium textured to moderately fine textured subsoil that is channery.

Dekalb soils are moderately deep, well drained, and moderately steep to very steep. They are on uplands. They formed in acid material weathered from sandstone interbedded with siltstone and shale. Dekalb soils have a black to brown, moderately coarse textured, channery surface layer and a pale brown, moderately coarse textured, channery and very channery subsoil.

Gilpin soils are moderately deep and moderately steep to steep. They are on uplands. They formed in acid material weathered from interbedded shale, siltstone, and sandstone. Gilpin soils have a dark grayish brown and dark brown to brown, medium textured surface layer and a yellowish brown to strong brown, medium textured to moderately fine textured subsoil that is channery or shaly in the lower part.

The minor soils in this map unit are mostly well drained Laidig soils on foot slopes and excessively

drained to moderately well drained Udifluvents, gravelly, and Udifluvents, loamy, on flood plains.

Most areas of this unit are wooded; very little is farmed. The soils on narrow flood plains are subject to flooding. Surface mining is common throughout this unit.

Slope, depth to bedrock, and flooding are the main limitations for nonfarm uses.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. The Kanawha series, for example, was named for Kanawha County.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Vandalia silt loam, 15 to 25 percent slopes, is one of several phases within the Vandalia series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Clymer-Dekalb complex, steep, is an example.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Quarries is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

AgB—Allegheny loam, shale substratum, 3 to 8 percent slopes. This gently sloping, well drained, deep soil is on high stream terraces that are above flood plains. Slopes are mainly smooth and convex. Areas are generally slightly elongated and range from about 5 to 20 acres.

Typically, the surface layer is brown to dark brown loam about 9 inches thick. The subsoil is friable and extends to a depth of 45 inches. The upper 12 inches is yellowish brown clay loam, the middle 14 inches is strong brown clay loam, and the lower 10 inches is strong brown gravelly heavy loam. The substratum is 23 inches thick. The upper 6 inches consists of strong brown gravelly loam with light gray mottles, and the lower 17 inches consists of strong brown, light gray, and dark reddish brown shale which crushes to silty clay loam and silty clay. Soft shale is at a depth of 68 inches.

Included with this soil in mapping are a few small areas of Monongahela and Vincent soils. Also included are a few small areas of coarser textured soils, soils that are shallower to bedrock, medium acid soils, nearly level soils, and soils that are underlain by sandstone bedrock. Included soils make up about 15 percent of this map unit.

Permeability of this soil is moderate in the surface layer and subsoil and slow to moderately slow in the substratum. Available water capacity is high. In unlimed areas, this soil is strongly acid or very strongly acid to a depth of about 55 inches and medium acid at a depth of more than 55 inches. Runoff is medium. Natural fertility is low to moderate. Bedrock is generally at a depth of more than 4 feet. The hazard of erosion is moderate.

This soil is used mainly for homesites. Some areas are used for pasture and hay or are idle. This soil has good potential for cultivated crops, hay, pasture, and trees. Potential for most nonfarm uses is good to fair.

This soil is suited to commonly grown cultivated crops, hay, and pasture. The erosion hazard in unprotected areas is a major management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, and returning crop residue to the soil help to control erosion and maintain fertility and tilth.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in spring are suitable pasture management practices.

This soil is suited to trees, but very few areas are wooded. The main concern of woodland management is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for some nonfarm uses by low strength and moderately slow or slow permeability. Removal of plant cover at construction sites should be minimal on this soil. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIe.

AgC—Allegheny loam, shale substratum, 8 to 15 percent slopes. This strongly sloping, well drained, deep soil is on high stream terraces that are above flood plains. Slopes are mainly smooth and convex. Areas are generally slightly elongated and range from about 5 to 30 acres.

Typically, the surface layer is brown to dark brown loam about 9 inches thick. The subsoil is friable and extends to a depth of 43 inches. The upper 12 inches is yellowish brown clay loam, the middle 12 inches is strong brown clay loam, and the lower 10 inches is strong brown gravelly heavy loam. The substratum is 23 inches thick. The upper 6 inches consists of strong brown gravelly loam mottled with light gray, and the lower 17 inches consists of strong brown, light gray, and dark reddish brown shale which crushes to silty clay loam and silty clay. Soft shale is at a depth of 66 inches.

Included with this soil in mapping are small areas of Monongahela and Vincent soils. Also included are a few small areas of moderately deep soils, coarser textured soils, medium acid soils, moderately steep soils, severely eroded soils, and soils that are underlain by sandstone bedrock. Included soils make up about 20 percent of this map unit.

Permeability of this soil is moderate in the surface layer and subsoil and slow to moderately slow in the substratum. Available water capacity is high. In unlimed areas, this soil is strongly acid or very strongly acid to a depth of about 50 inches and medium acid at a depth of more than 50 inches. Runoff is rapid. Natural fertility is low to moderate. Bedrock is generally at a depth of more than 4 feet. The hazard of erosion is moderate.

This soil is used mainly for homesites. Some areas are used for pasture and hay or are idle. This soil has fair potential for cultivated crops and good potential for hay, pasture, and trees. Potential for most nonfarm uses is fair.

This soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard in unprotected areas is a major management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suited to trees, but very few areas are wooded. The main concern in woodland management is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for some nonfarm uses by slope, low strength, and moderately slow or slow permeability. Removal of plant cover at construction sites should be minimal on this soil. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIIe.

CaC—Clymer loam, 10 to 20 percent slopes. This strongly sloping, well drained, deep soil is on ridgetops. Slopes are mainly smooth and convex. Areas are elongated or irregular in shape and range from 6 to 50 acres.

Typically, the surface layer is brown loam about 7 inches thick. The subsoil is friable and extends to a depth of 39 inches. The upper 7 inches is yellowish brown channery loam. The middle 20 inches is strong brown channery clay loam. The lower 5 inches is strong brown channery light clay loam. The substratum is mixed strong brown and yellowish red very channery light clay loam 16 inches thick. Sandstone and shale bedrock is at a depth of 57 inches.

Included with this soil in mapping are a few small areas of Gilpin and Coolville soils. Also included are a few small areas of gently sloping soils and areas of moderately deep soils. Included soils make up about 15 percent of this map unit.

Permeability of this soil is moderate to moderately rapid. Available water capacity is moderate to high. In unlimed areas the soil is strongly acid or very strongly acid throughout. Runoff is rapid. Natural fertility is moderate. Bedrock is at a depth of more than 40 inches. The hazard of erosion is moderate.

This soil is mostly in pasture, is wooded, or is idle. Some areas are used for homesites. This soil has fair potential for cultivated crops and good potential for hay, pasture, and trees. Potential for most nonfarm uses is fair.

This soil is suited to commonly grown cultivated crops and to hay and pasture plants. The erosion hazard in un-

protected areas is a major management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees, and much of it is wooded. The main concern in woodland management is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for many nonfarm uses by slope and shallow depth to bedrock. Removal of plant cover at construction sites should be minimal on this soil. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIIe.

CDD—Clymer-Dekalb complex, moderately steep. This complex consists of moderately steep, well drained, deep and moderately deep soils on narrow ridgetops and benches. Slopes range from 20 to 30 percent. Areas of these soils are generally long and narrow. The areas range from about 5 to 100 acres. These soils are so intermingled that it was not practical to map them separately. This complex is about 50 percent Clymer channery loam, 30 percent Dekalb channery sandy loam, and 20 percent soils of minor extent.

Typically, the surface layer of the Clymer soil is very dark grayish brown and yellowish brown channery loam about 5 inches thick. The subsoil is friable and extends to a depth of 38 inches. The upper 8 inches is yellowish brown channery loam. The middle 20 inches is strong brown channery clay loam. The lower 5 inches is strong brown channery light clay loam. The substratum is mixed strong brown and yellowish red very channery light clay loam 18 inches thick. Sandstone and shale bedrock is at a depth of 56 inches.

Typically, the Dekalb soil has a surface layer of black and brown channery sandy loam about 4 inches thick. The subsoil is pale brown and is 30 inches thick. The upper 7 inches is very friable channery sandy loam, the middle 10 inches is firm channery sandy loam, and the lower 13 inches is firm very channery sandy loam coated with yellowish red. Sandstone bedrock is at a depth of 34 inches.

Included with these soils in mapping are areas that are as much as 10 acres of well drained Gilpin and Laidig soils and moderately well drained Coolville soils. Also included are some areas that are as much as 10 acres of strongly sloping soils, very stony soils, and rock outcrop.

Permeability is moderate to moderately rapid in the Clymer soil and moderately rapid to rapid in the Dekalb soil. Available water capacity is moderate to high in the Clymer soil and very low to moderate in the Dekalb soil. The root zone of some plants is restricted by bedrock in the Dekalb soil at a depth of 20 to 40 inches. In unlimed areas the surface layer and subsoil of both soils are commonly strongly acid or very strongly acid. Runoff is rapid. Natural fertility is moderate in the Clymer soil and low in the Dekalb soil. Bedrock is at a depth of more than 40 inches in the Clymer soil.

This complex is used mainly for woodland and pasture. Some areas are idle. This complex has poor potential for cultivated crops, fair potential for hay and pasture, and good potential for trees. Potential for most nonfarm uses is poor.

The soils of this complex are poorly suited to commonly grown cultivated crops. Erosion is the main limitation. The soils are better suited to hay and pasture. If the soils are cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing are suitable pasture management practices.

The soils of this complex are suitable for trees. The main woodland management concerns are slope and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

The Clymer soil in this complex is limited for most nonfarm uses by slope, and the Dekalb soil is limited by slope and depth to bedrock. Removal of vegetative cover at construction sites should be minimal on this soil. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IVe.

CDE—Clymer-Dekalb complex, steep. This complex consists of steep, well drained, deep and moderately deep soils on narrow ridgetops and benches and on side slopes. Slopes range from 30 to 40 percent. Areas of these soils are mainly elongated and winding on ridgetops and benches and are generally irregular in shape on side slopes. The areas range from 5 to about 200 acres, and the larger areas are on side slopes. These soils are so intermingled on the landscape that it was not practical to map them separately. This complex is about 45 percent Clymer channery loam, 30 percent Dekalb channery sandy loam, and 25 percent soils of minor extent.

Typically, the surface layer of the Clymer soil is very dark grayish brown and yellowish brown channery loam about 5 inches thick. The subsoil is friable and extends to a depth of 38 inches. The upper 8 inches is yellowish brown channery loam. The middle 20 inches is strong brown channery clay loam. The lower 5 inches is strong brown channery light clay loam. The substratum is mixed strong brown and yellowish red very channery light clay loam 16 inches thick. Sandstone and shale bedrock is at a depth of 54 inches.

Typically, the Dekalb soil has a surface layer of black and brown channery sandy loam about 4 inches thick. The

subsoil is pale brown and is 28 inches thick. The upper 7 inches is very friable channery sandy loam, the next 10 inches is firm channery sandy loam, and the lower 11 inches is firm very channery sandy loam coated with yellowish red. Sandstone bedrock is at a depth of 32 inches.

Included with these soils in mapping are areas that are as much as 10 acres of well drained Gilpin and Laidig soils. Also included are areas that are as much as 10 acres of very stony soils and rock outcrop.

Permeability is moderate to moderately rapid in the Clymer soil and moderately rapid to rapid in the Dekalb soil. Available water capacity is moderate to high in the Clymer soil and very low to moderate in the Dekalb soil. The root zone of some plants is restricted by bedrock in the Dekalb soil at a depth of 20 to 40 inches. In unlimed areas the surface layer and subsoil of these soils are commonly strongly acid or very strongly acid. Runoff is rapid. Natural fertility is moderate in the Clymer soil and low in the Dekalb soil. Bedrock is at a depth of more than 40 inches in the Clymer soil. The hazard of erosion is severe.

This complex is used mainly for woodland and pasture. Some areas are strip mined. The soils of this complex have poor potential for hay, fair potential for pasture, and good potential for trees. Potential for most nonfarm uses is poor.

The soils of this complex are unsuited to commonly grown cultivated crops because of slope and the erosion hazard. They are better suited to permanent pasture or trees.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are the major pasture management needs.

The soils of this complex are suited to trees. The main woodland management concerns are slope and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

The Clymer soil in this complex is limited for most nonfarm uses by slope. The Dekalb soil is limited for most nonfarm uses by slope and depth to bedrock. Removal of plant cover should be minimal on these soils. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass VIe.

CDF—Clymer-Dekalb complex, very steep. This complex consists of very steep, well drained, deep and moderately deep soils on ridgetops and side slopes. Slopes range from 40 to 70 percent. Areas are generally irregular in shape on the rugged part of the landscape and are elongated on narrow ridgetops or on side slopes or benches in the less rugged part of the landscape. The areas range from about 10 to several hundred acres. These soils are so intermingled that it was not practical to map them separately. This complex is about 40 percent Clymer channery loam, 35 percent Dekalb channery sandy loam, and 25 percent soils of minor extent.

Typically, the surface layer of the Clymer soil is very dark grayish brown and yellowish brown channery loam about 4 inches thick. The subsoil is friable and extends to a depth of 37 inches. The upper 8 inches is yellowish brown channery loam. The next 20 inches is strong brown channery clay loam. The lower 5 inches is strong brown channery light clay loam. The substratum is mixed strong brown and yellowish red very channery light clay loam 15 inches thick. Sandstone and shale bedrock is at a depth of 52 inches.

Typically, the Dekalb soil has a surface layer of black and brown channery sandy loam about 3 inches thick. The subsoil is pale brown and is 27 inches thick. The upper 7 inches is very friable channery sandy loam, the next 10 inches is firm channery sandy loam, and the lower 10 inches is firm very channery sandy loam coated with yellowish red. Sandstone bedrock is at a depth of 30 inches.

Included with these soils in mapping are areas that are as much as 10 acres of well drained Gilpin and Laidig soils. Also included are areas that are as much as 10 acres of very stony soils and rock outcrop.

Permeability is moderate to moderately rapid in the Clymer soil and moderately rapid to rapid in the Dekalb soil. Available water capacity is moderate to high in the Clymer soil and very low to moderate in the Dekalb soil. The root zone is restricted by bedrock in the Dekalb soil at a depth of 20 to 40 inches. In unlimed areas the surface layer and subsoil of these soils are commonly strongly acid or very strongly acid. Runoff is very rapid. Natural fertility is moderate in the Clymer soil and low in the Dekalb soil. Bedrock is at a depth of more than 40 inches in the Clymer soil. The hazard of erosion is severe.

This complex is used mainly for woodland. Some areas are strip mined. The soils of this complex have poor potential for hay or pasture and fair potential for trees. Potential for most nonfarm uses is poor.

These soils are unsuited to cultivated crops, hay, or pasture because of slope and erosion. They are better suited to woodland.

The soils of this complex are suited to trees. The main woodland management concerns are erosion, slope, and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

The Clymer soil in this complex is limited for most nonfarm uses by slope. The Dekalb soil is limited for most nonfarm uses by slope and depth to bedrock. Removal of plant cover should be minimal on these soils. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass VIIe.

CoB—Coolville silt loam, 3 to 10 percent slopes. This gently sloping, moderately well drained, deep soil is on ridgetops. Slopes are convex. The larger areas of this soil are mainly elongated, and the smaller areas are somewhat oval to irregular in shape. The areas range from about 5 to 35 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil extends to a depth of 47

inches. The upper part consists of 8 inches of yellowish brown, friable light silty clay loam underlain by 7 inches of strong brown, firm silty clay loam. The lower part consists of 10 inches of red and strong brown, firm silty clay with light brownish gray mottles and is underlain by 15 inches of very firm, red clay with light brownish gray mottles. The substratum is 13 inches thick. It is light brownish gray silty clay with red and strong brown mottles. Light olive brown shale is a depth of 60 inches.

Included with this soil in mapping are a few small areas of Gilpin and Monongahela soils. Also included are a few small areas of somewhat poorly drained soils, soils with a low clay content, moderately deep soils, and nearly level soils. Included soils make up about 15 percent of this map unit.

Permeability of this soil is slow to very slow in the lower part of the subsoil and moderate in the upper part. Available water capacity is high. The root zone of some plants is restricted by a seasonal high water table at a depth of 18 to 30 inches. In unlimed areas this soil is strongly acid to extremely acid throughout. Runoff is medium. Natural fertility is moderate to low. Bedrock is generally at a depth of more than 4 feet. The hazard of erosion is moderate.

This soil is mostly cleared and used mainly for pasture. Some areas are idle. This soil has good potential for cultivated crops, hay, pasture, and trees. Potential for most nonfarm uses is fair to poor.

This soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard in unprotected areas is a management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, and returning crop residue to the soil help to control erosion and maintain fertility and tilth.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees, but very few areas are wooded. The main concern in woodland management is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for many nonfarm uses by a seasonal high water table, low strength, moderate shrink-swell potential, and slow to very slow permeability. Removal of plant cover at construction sites should be minimal on this soil. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIe.

CoC—Coolville silt loam, 10 to 20 percent slopes. This strongly sloping, moderately well drained, deep soil is on benches and ridgetops. Slopes are convex. Areas of this soil are mainly elongated or irregular in shape. They range from about 5 to 40 acres.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil extends to a depth of 45 inches. The upper part consists of 8 inches of yellowish brown, friable light silty clay loam underlain by 7 inches of strong brown, firm silty clay loam. The lower part consists of 10 inches of red and strong brown, firm silty clay with light brownish gray mottles and is underlain by 14 inches of very firm, red clay with light brownish gray mottles. The substratum is 13 inches thick. It is light brownish gray silty clay with red and strong brown mottles. Light olive brown shale is at a depth of 58 inches.

Included with this soil in mapping are a few small areas of Gilpin, Allegheny, and Monongahela soils. Also included are a few small areas of coarser textured soils, moderately deep soils, and severely eroded soils. Included soils make up about 15 percent of this map unit.

Permeability of this soil is slow to very slow in the lower part of the subsoil and moderate in the upper part. Available water capacity is high. The root zone of some plants is restricted by a seasonal high water table at a depth of 18 to 30 inches. In unlimed areas this soil is strongly acid to extremely acid throughout. Runoff is rapid. Natural fertility is moderate to low. Bedrock is generally at a depth of more than 4 feet. The hazard of erosion is moderate.

This soil is mostly cleared and used for pasture. Some areas are idle. This soil has fair potential for cultivated crops and good potential for hay, pasture, and trees. Potential for most nonfarm uses is fair to poor.

This soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard in unprotected areas is a major management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. The main concern of woodland management is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for some nonfarm uses by slope, a seasonal high water table, slow to very slow permeability, moderate shrink-swell potential, and low strength. Removal of vegetative cover should be minimal on this soil. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIIe.

CrC3—Coolville silty clay loam, 10 to 20 percent slopes, severely eroded. This strongly sloping, moderately well drained, deep soil is on benches and ridgetops. Slopes are convex. Areas of this soil are mainly elongated or irregular in shape. They range from about 5 to 30 acres.

Typically, the surface layer is dark brown silty clay loam about 6 inches thick. The subsoil extends to a depth of 41 inches. The upper part consists of 4 inches of yellowish brown, friable light silty clay loam underlain by 7 inches of strong brown, firm silty clay loam. The lower part consists of 10 inches of red and strong brown, firm silty clay with light brownish gray mottles and is underlain by 14 inches of very firm, red clay with light brownish gray mottles. The substratum is 13 inches thick. It is light brownish gray silty clay with red and strong brown mottles. Light olive brown shale is at a depth of 54 inches.

Included with this soil in mapping are a few small areas of Gilpin, Allegheny, and Monongahela soils; soils that are high in sand content; and moderately deep soils. Included soils make up about 15 percent of this map unit.

Permeability of this soil is slow to very slow in the lower part of the subsoil and moderate in the upper part. Available water capacity is high. The root zone of some plants is restricted by a seasonal high water table at a depth of 18 to 30 inches. In unlimed areas this soil is strongly acid to extremely acid throughout. Runoff is rapid. Natural fertility is moderate to low. Bedrock is generally at a depth of more than 4 feet. The hazard of erosion is severe.

This soil is mostly cleared and used for pasture. Some areas are idle. This soil has poor potential for cultivated crops, fair potential for hay and pasture, and good potential for trees.

This soil is poorly suited to commonly grown cultivated crops but is better suited to hay and pasture. The erosion hazard in unprotected areas is the main management concern. If the soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. The main concern of woodland management is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for some nonfarm uses by slope, a seasonal high water table, slow to very slow permeability, moderate shrink-swell potential, and low strength. Removal of vegetative cover should be minimal on this soil. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IVe.

Ct—Cotaco loam. This nearly level, moderately well drained, deep soil is on low stream terraces. Slopes are smooth and generally concave. Areas of this soil are mainly elongated or irregular in shape. They range from about 5 to 60 acres.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil extends to a depth of 44 inches. The upper 6 inches is dark brown, friable loam; the next 7 inches is yellowish brown, friable to firm sandy clay loam; the next 7 inches is yellowish brown, firm light clay loam with strong brown and light brownish gray mottles; and the lower 16 inches is yellowish brown, firm light clay loam with yellowish brown and light brownish gray mottles. The substratum is yellowish brown and light brownish gray light clay loam to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Kanawha, Monongahela, and Tyler soils and a few small areas of gently sloping soils. Also included are areas of Cotaco soils along the Pocatalico River that have a redder tint than this Cotaco soil. Included soils make up about 15 percent of this map unit.

Permeability is moderate. Available water capacity is moderate to high. The root zone of some plants is restricted by a seasonal high water table at a depth of 18 to 30 inches. In unlimed areas this soil is strongly acid to extremely acid throughout. Runoff is medium. Natural fertility is low to moderate. Bedrock is generally at a depth of more than 5 feet. This soil is subject to rare flooding.

This soil is mainly used for pasture and homesites. Some areas are idle. This soil has good potential for cultivated crops, hay, pasture, and trees. Potential for most nonfarm uses is fair.

This soil is suited to commonly grown cultivated crops, hay, and pasture. Small wet areas need drainage before most crops can be grown on this soil (fig. 3). The use of cover crops and incorporating crop residue into the soil help maintain fertility. Crops are damaged rarely by flooding in some areas.

Maintaining a mixture of grasses and legumes and preventing overgrazing and grazing when the soil is wet are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. A few areas are wooded. The main concern in woodland management is competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for many nonfarm uses by a seasonal high water table and low strength. Removal of plant cover at construction sites should be minimal on this soil. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIw.

Dm—Dumps. This unit consists of accumulations of waste from industrial, commercial, and municipal operations. Tailings, chemicals, fly ash, coal dumps, and solid waste are examples of areas included in this unit. Some areas are in settling ponds, and others are in landfill operations. Many areas of Dumps are not covered by soil material. Some areas have been reclaimed and used as

building sites. Dumps range from about 5 to 105 acres. Capability subclass not assigned.

FL—Fluvaquents. These nearly level, poorly drained or somewhat poorly drained, deep soils are mainly on flood plains. Slopes are mainly smooth and concave. Areas of these soils are somewhat oval to elongated and irregular in shape. They range from about 5 to 20 acres.

Generally, the surface layer is dominantly silt loam and ranges from dark gray to pale brown. It is about 7 inches thick. The subsoil is dominantly gray and ranges from silt loam to silty clay. The substratum ranges from loam to silty clay loam and is stratified in places. It is dominantly gray. Bedrock is mainly at a depth of more than 4 feet.

Included with these soils in mapping are a few small areas of Tyler soils and Udifluvents, loamy. Also included are a few small areas of steeper soils. Included soils make up about 15 percent of this map unit.

Permeability is slow to moderate. Available water capacity is moderate to high. Runoff is slow. A seasonal high water table is at a depth of 6 to 18 inches. Bedrock is generally at a depth of more than 4 feet. These soils are subject to common to rare flooding. In unlimed areas these soils are very strongly acid to neutral throughout.

Areas of this unit have fair potential for most farm uses and good potential for trees and some types of wildlife habitat. These soils have poor potential for most nonfarm uses. Most areas are idle. Capability subclass not assigned.

GIC—Gilpin silt loam, 10 to 20 percent slopes. This strongly sloping, well drained, moderately deep soil is on ridgetops and benches. Slopes are mainly smooth and convex. Areas are generally elongated and commonly long and winding. They range from about 5 to 45 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of 32 inches. The upper 5 inches is yellowish brown, very friable silt loam. The next 4 inches is yellowish brown, friable silty clay loam. The next 8 inches is strong brown, friable channery silty clay loam. The lower 7 inches is strong brown, friable channery light silty clay loam. The substratum is strong brown very channery heavy silt loam 5 inches thick. Bedrock is at a depth of 37 inches.

Included with this soil in mapping are a few small areas of Coolville and Upshur soils. Also included are a few small areas of severely eroded soils and gently sloping soils. Included soils make up about 15 percent of this map unit.

Permeability is moderate in the subsoil. Available water capacity is moderate. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches. In unlimed areas this soil is strongly acid to very strongly acid throughout. Runoff is rapid. Natural fertility is low to moderate. The hazard of erosion is moderate.

This soil is used mostly for hay, pasture, and woodland. Some areas are idle. This soil has fair potential for cultivated crops and good potential for hay, pasture, and trees. Potential for most nonfarm uses is fair.

This soil is suited to commonly grown cultivated crops, hay, and pasture. The erosion hazard in unprotected areas is a major management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees, and much of it is wooded. The main woodland management concern is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for many nonfarm uses by slope and depth to bedrock. Removal of plant cover at construction sites should be minimal on this soil. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIIe.

GID—Gilpin silt loam, 20 to 30 percent slopes. This moderately steep, well drained, moderately deep soil is on ridgetops and benches. Slopes are mainly smooth and convex. Areas of this soil are generally long and winding. They range from about 5 to more than 200 acres.

Typically, a mat of leaf litter about 3 inches thick covers the surface of this soil. The surface layer is dark grayish brown and brown to dark brown silt loam 7 inches thick. The subsoil extends to a depth of 31 inches. The upper 5 inches is yellowish brown, very friable silt loam. The next 4 inches is yellowish brown, friable silty clay loam. The next 8 inches is strong brown, friable, channery silty clay loam. The lower 7 inches is strong brown, friable channery light silty clay loam. The substratum is strong brown very channery heavy silt loam 5 inches thick. Bedrock is at a depth of 36 inches.

Included with this soil in mapping are a few small areas of Dekalb, Coolville, Upshur, and Laidig soils. Also included are a few small areas of severely eroded soils and very stony soils. Included soils make up about 15 percent of this map unit.

Permeability is moderate in the subsoil. Available water capacity is moderate. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches. In unlimed areas this soil is strongly acid to very strongly acid throughout. Runoff is rapid. Natural fertility is low to moderate.

This soil is used mostly for hay, pasture, or woodland. Some areas are idle. This soil has poor potential for cultivated crops, fair potential for hay and pasture, and good potential for trees. Potential for most nonfarm uses is poor.

This soil is poorly suited to commonly grown cultivated crops. The hazard of erosion is the main limitation. The soil is better suited to hay and pasture. If the soil is cul-

tivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, maintaining grassed waterways, and seeding severely eroded areas to a permanent cover help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. The main woodland management concerns are erosion and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by slope and depth to bedrock. Removal of plant cover at construction sites should be minimal on this soil. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IVe.

GlE—Gilpin silt loam, 30 to 40 percent slopes. This steep, well drained, moderately deep soil is on side slopes, benches, and ridgetops. Slopes are generally convex. The side slopes are commonly broken by narrow benches. Areas of this soil commonly wind along the benches and ridgetops and are irregular in shape on the side slopes. The areas range from about 5 to more than 200 acres.

Typically, a mat of leaf litter about 3 inches thick covers the surface of this soil. The surface layer is dark grayish brown and brown to dark brown silt loam 6 inches thick. The subsoil extends to a depth of 30 inches. The upper 5 inches is yellowish brown, very friable silt loam. The next 4 inches is yellowish brown, friable silty clay loam. The next 8 inches is strong brown, friable channery silty clay loam. The lower 7 inches is strong brown, friable channery light silty clay loam. The substratum is strong brown very channery heavy silt loam 5 inches thick. Bedrock is at a depth of 35 inches.

Included with this soil in mapping are a few small areas of Clymer, Dekalb, Coolville, Upshur, and Laidig soils. Also included are a few small areas of severely eroded soils, very stony soils, and soils that have a very shaly subsoil. Included soils make up about 15 percent of this map unit.

Permeability is moderate in the subsoil. Available water capacity is moderate. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches. In unlimed areas this soil is strongly acid to very strongly acid throughout. Runoff is rapid. Natural fertility is low to moderate. The hazard of erosion is severe.

This soil is used mainly for woodland or pasture. This soil has poor potential for hay, fair potential for pasture, and good potential for trees. Potential for most nonfarm uses is poor.

This soil is unsuited to cultivated crops and hay because of steep slopes and the severe erosion hazard. It is better suited to permanent pasture.

Maintaining a mixture of grasses and legumes and preventing overgrazing are the major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. The main woodland management concerns are erosion and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by slope and depth to bedrock. Removal of plant cover should be minimal on this soil. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass VIe.

GpC—Gilpin-Upshur silt loams, 10 to 20 percent slopes. This complex consists of strongly sloping, well drained, moderately deep and deep soils on benches and ridgetops. Areas of these soils are mainly elongated and commonly are long and winding. They range from about 5 to 100 acres. These soils are so intermingled that it was not practical to map them separately. The mapped acreage of this complex is about 45 percent Gilpin silt loam, 45 percent Upshur silt loam, and 10 percent soils of minor extent. In some places Upshur soils make up about 85 percent of this complex.

Typically, the surface layer of the Gilpin soil is dark grayish brown and brown to dark brown silt loam 8 inches thick. The subsoil extends to a depth of 32 inches. The upper 5 inches is yellowish brown, very friable silt loam. The next 4 inches is yellowish brown, friable silty clay loam. The next 8 inches is strong brown, friable channery silty clay loam. The lower 7 inches is strong brown, friable channery light silty clay loam. The substratum is strong brown very channery heavy silt loam 5 inches thick. Bedrock is at a depth of 37 inches.

Typically, the Upshur soil has a surface layer of dark brown silt loam about 8 inches thick. The subsoil is firm and extends to a depth of 34 inches. The upper 5 inches is dark reddish brown, sticky and plastic clay. The next 6 inches is dark red, very sticky and very plastic clay. The lower 15 inches is dark reddish brown, very sticky and very plastic clay. The substratum is reddish brown and pinkish gray shaly clay 8 inches thick. Weak red, yellowish red, and light olive brown calcareous shale is at a depth of 42 inches.

Included with these soils in mapping are a few small areas of Coolville soils. Also included are a few small areas of less sloping soils and severely eroded soils.

Permeability is moderate in the subsoil of the Gilpin soil and slow in the subsoil and substratum of the Upshur soil. Available water capacity is moderate in the Gilpin soil and moderate to high in the Upshur soil. The root zone of some plants is restricted by bedrock in the Gilpin soil at a depth of 20 to 40 inches. In unlimed areas the Gilpin is strongly acid to very strongly acid throughout. The Upshur soil is strongly acid or slightly

acid in the upper part of the subsoil and medium acid to neutral in the lower part. Runoff is rapid. Natural fertility is low to moderate in the Gilpin soil and moderately high in the Upshur soil. The Upshur soil has a high shrink-swell potential in the subsoil. Depth to bedrock ranges from 34 to 50 inches in the Upshur soil. The hazard of erosion is moderate.

This complex is used mainly for hay, pasture, or woodland. Some areas are idle. The soils have fair potential for cultivated crops and good potential for hay, pasture, and trees. Potential for most nonfarm uses is fair to poor.

The soils of this complex are suited to commonly grown cultivated crops and pasture. The erosion hazard in unprotected areas is a major management concern. If these soils are cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

These soils are suitable for trees. Many of the areas are wooded. The main concerns of woodland management are the erosion hazard, the high clay content of the Upshur soil, and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

The Gilpin soil in this complex is limited for many nonfarm uses by depth to bedrock. The Upshur soil is limited for most nonfarm uses by a high shrink-swell potential, low strength, slow permeability, and a slip hazard. Removal of plant cover at construction sites should be minimal on these soils. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIIe.

GpD—Gilpin-Upshur silt loams, 20 to 30 percent slopes. This complex consists of moderately steep, well drained, moderately deep and deep soils on narrow ridgetops and benches. Areas of these soils are mainly elongated. They range from about 5 to more than 300 acres. These soils are so intermingled that it was not practical to map them separately. Soil slips are in some areas of this complex. This complex is about 50 percent Gilpin silt loam, 35 percent Upshur silt loam, and 15 percent soils of minor extent.

Typically, the surface layer of the Gilpin soil is dark grayish brown and brown to dark brown silt loam 6 inches thick. The subsoil extends to a depth of 31 inches. The upper 5 inches is yellowish brown, very friable silt loam. The next 4 inches is yellowish brown, friable silty clay loam. The next 8 inches is strong brown, friable channery silty clay loam. The lower 8 inches is strong brown, friable channery light silty clay loam. The substratum is strong brown, very channery heavy silt loam 5 inches thick. Bedrock is at a depth of 36 inches.

Typically, the surface layer of the Upshur soil is dark brown silt loam about 7 inches thick. The subsoil is firm and extends to a depth of 31 inches. The upper 5 inches is dark reddish brown, sticky and plastic clay. The next 6 inches is dark red, very sticky and very plastic clay. The lower 13 inches is dark reddish brown, very sticky and very plastic clay. The underlying material is reddish brown and pinkish gray shaly clay 9 inches thick. Weak red, yellowish red, and light olive brown calcareous shale is at a depth of 40 inches.

Included with these soils in mapping are a few small areas of Clymer, Coolville, and Vandalia soils. Also included are a few small areas of soils that are higher in sand content, severely eroded soils, and stony soils.

Permeability is moderate in the subsoil of the Gilpin soil and slow in the subsoil and substratum of the Upshur soil. Available water capacity is moderate in the Gilpin soil and moderate to high in the Upshur soil. In the Gilpin soil the root zone of some plants is restricted by bedrock, which is at a depth of 20 to 40 inches. In unlimed areas the Gilpin soil is strongly acid to very strongly acid throughout, and the Upshur soil is strongly acid or slightly acid in the upper part of the subsoil and medium acid to neutral in the lower part. Runoff is rapid. Natural fertility is low to moderate in the Gilpin soil and moderately high in the Upshur soil. The Upshur soil has a high shrink-swell potential in the subsoil. Depth to bedrock ranges from 34 to 50 inches in the Upshur soil.

This complex is used mainly for hay, pasture, or woodland. Some areas are idle. These soils have poor potential for cultivated crops, fair potential for hay or pasture, and good potential for trees. Poential for most nonfarm uses is poor.

The soils of this complex are poorly suited to commonly grown cultivated crops. They are better suited to hay and pasture and trees. The hazard of erosion is the main limitation. If the soils are cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soils, maintaining grassed waterways, and seeding severely eroded areas to a permanent cover help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

These soils are suited to trees. The main woodland management concerns are the hazard of erosion; competition to pines and hardwoods from undesirable woody plants, grasses, and weeds; and the high clay content of the subsoil in the Upshur soil.

The Gilpin soil in this complex is limited for most nonfarm uses by slope and depth to bedrock. The Upshur soil is limited for most nonfarm uses by slope, high shrink-

swell potential, low strength, slow permeability, and a slip hazard. Removal of plant cover should be minimal on these soils. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IVe.

GRE—Gilpin-Upshur silt loams, steep. This complex consists of steep, well drained, moderately deep and deep soils on narrow ridgetops and benches and on side slopes. Slopes range from 30 to 40 percent. Areas of these soils are mainly elongated on the ridgetops and benches and are generally irregular in shape and larger on the side slopes. Areas of these soils range from about 5 to more than 200 acres. These soils are so intermingled on the landscape that mapping them separately was impractical. Soil slips are in some areas of this complex. The complex is about 50 percent Gilpin silt loam, 25 percent Upshur silt loam, and 25 percent other soils.

Typically, the Gilpin soil has a mat of leaf litter about 3 inches thick that covers the surface. The surface layer is dark grayish brown and brown to dark brown silt loam 6 inches thick. The subsoil extends to a depth of 30 inches. The upper 5 inches is yellowish brown, very friable silt loam. The next 4 inches is yellowish brown, friable silty clay loam. The next 8 inches is strong brown, friable channery silty clay loam. The lower 7 inches is strong brown, friable channery light silty clay loam. The substratum is strong brown very channery heavy silt loam 5 inches thick. Bedrock is at a depth of 35 inches.

Typically, the surface layer of the Upshur soil is dark brown silt loam about 6 inches thick. The subsoil is firm and extends to a depth of 30 inches. The upper 5 inches is dark reddish brown, sticky and plastic clay. The next 6 inches is dark red, very sticky and very plastic clay. The lower 13 inches is dark reddish brown, very sticky and very plastic clay. The substratum is reddish brown and pinkish gray shaly clay 8 inches thick. Weak red, yellowish red, and light olive brown calcareous shale is at a depth of 38 inches.

Included with these soils in mapping are areas that are as much as 10 acres of well drained Clymer, Dekalb, and Vandalia soils and of soils that have a very channery subsoil, severely eroded soils, and very stony soils.

Permeability is moderate in the subsoil of the Gilpin soil and slow in the subsoil and substratum of the Upshur soil. Available water capacity is moderate in the Gilpin soil and moderate to high in the Upshur soil. In the Gilpin soil the root zone of some plants is restricted by bedrock, which is at a depth of 20 to 40 inches. In unlimed areas the Gilpin soil is strongly acid to very strongly acid throughout, and the Upshur soil is strongly acid or slightly acid in the upper part of the subsoil and medium acid to neutral in the lower part. Runoff is rapid. The hazard of erosion is severe. Natural fertility is low to moderate in the Gilpin soil and moderately high in the Upshur soil. The Upshur soil has a high shrink-swell potential in the subsoil. Depth to bedrock ranges from 34 to 50 inches in the Upshur soil.

This complex is used mainly for pasture or woodland. Some areas are idle. The soils of this complex have poor potential for hay, fair potential for pasture, and good potential for trees. Potential for most nonfarm uses is poor.

The soils of this complex are unsuited to commonly grown cultivated crops because of steep slopes and the severe erosion hazard. They are better suited to permanent pasture or trees.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This complex is suitable for trees. The main woodland management concerns are the erosion hazard; equipment limitations; plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds; and the clayey subsoil of the Upshur soil.

The Gilpin soil in this complex is limited for most nonfarm uses by slope and depth to bedrock. The Upshur soil is limited for most nonfarm uses by slope, high shrink-swell potential, low strength, slow permeability, and a slip hazard. Removal of vegetative cover from these soils should be minimal. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass VIe.

GRF—Gilpin-Upshur silt loams, very steep. This complex consists of very steep, well drained, moderately deep and deep soils on breaks beneath ridgetops, on breaks between benches, and on side slopes. Slopes range from 40 to 55 percent. Areas of these soils are generally elongated on the breaks under ridgetops and between benches and are large and irregular in shape on the side slopes. Areas range from about 5 to several hundred acres. These soils are so intermingled on the landscape that mapping them separately was impractical. Soil slips, rock outcrops, and bedrock escarpments are common in some areas. This complex is about 55 percent Gilpin silt loam, 20 percent Upshur silt loam, and 25 percent other soils.

Typically, the Gilpin soil has a mat of leaf litter 3 inches thick that covers the surface. The surface layer is dark grayish brown and brown to dark brown silt loam 5 inches thick. The subsoil extends to a depth of 28 inches. The upper 5 inches is yellowish brown, very friable silt loam. The next 4 inches is yellowish brown, friable silty clay loam. The next 8 inches is strong brown, friable channery silty clay loam. The lower 6 inches is strong brown, friable channery light silty clay loam. The substratum is strong brown very channery heavy silt loam 4 inches thick. Bedrock is at a depth of 32 inches.

Typically, the Upshur soil has a surface layer that is dark brown silt loam about 5 inches thick. The subsoil is firm and extends to a depth of 29 inches. The upper 5 inches is dark reddish brown, sticky and plastic clay. The

next 6 inches is dark red, very sticky and very plastic clay. The lower 13 inches is dark reddish brown, very sticky and very plastic clay. The substratum is reddish brown and pinkish gray shaly clay 8 inches thick. Weak red, yellowish red, and light olive brown calcareous shale is at a depth of 37 inches.

Included with these soils in mapping are areas that are as much as 10 acres of well drained Clymer and Dekalb soils and of severely eroded soils, soils which have a very channery or very shaly subsoil, and very stony soils.

Permeability is moderate in the subsoil of the Gilpin soil and slow in the subsoil and substratum of the Upshur soil. Available water capacity is moderate in the Gilpin soil and moderate to high in the Upshur soil. In the Gilpin soil the root zone of some plants is restricted by bedrock, which is at depth of 20 to 40 inches. In unlimed areas, the Gilpin soil is strongly acid to very strongly acid throughout, and the Upshur soil is strongly acid or slightly acid in the upper part of the subsoil and medium acid to neutral in the lower part. Runoff is rapid. The hazard of erosion is very severe. Natural fertility is low to moderate in the Gilpin soil and moderately high in the Upshur soil. The Upshur soil has a high shrink-swell potential in the subsoil. Depth to bedrock ranges from 34 to 50 inches in the Upshur soil.

These soils are used mainly for woodland. Some areas are idle. The soils of this complex have poor potential for hay or pasture and good potential for trees. Potential for most nonfarm uses is poor.

These soils are not suited to cultivated crops, hay, or pasture because of very steep slopes and the very severe erosion hazard. They are better suited to woodland.

This complex is suitable for trees. The main woodland management concerns are the erosion hazard; equipment limitations; plant competition from undesirable plants, grasses, and weeds; and the clayey subsoil of the Upshur soil.

The Gilpin soil in this complex is limited for most nonfarm uses by very steep slopes and depth to bedrock. The Upshur soil is limited for most nonfarm uses by very steep slopes, high shrink-swell potential, low strength, slow permeability, and a slip hazard. Removal of plant cover from these soils should be minimal. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass VIIe.

GsC3—Gilpin-Upshur complex, 10 to 20 percent slopes, severely eroded. This complex consists of strongly sloping, well drained, moderately deep and deep soils on benches and ridgetops. Areas of these soils are generally elongated. They range from about 5 to 70 acres. These soils are so intermingled on the landscape that mapping them separately was impractical. This complex is generally about 45 percent Gilpin silt loam, 45 percent Upshur silty clay loam, and 10 percent other soils. Upshur soils make up about 85 percent of some areas of this complex.

Typically, the surface layer of the Gilpin soil is brown to dark brown silt loam about 4 inches thick. The subsoil extends to a depth of 26 inches. The upper 3 inches is yellowish brown, very friable silt loam. The next 4 inches is yellowish brown, friable silty clay loam. The next 8 inches is strong brown, friable channery silty clay loam. The lower 7 inches is strong brown, friable channery light silty clay loam. The substratum is strong brown very channery heavy silt loam 7 inches thick. Bedrock is at a depth of 33 inches.

Typically, the surface layer of the Upshur soil is reddish brown silty clay loam about 4 inches thick. The subsoil is firm and extends to a depth of 30 inches. The upper 5 inches is dark reddish brown, sticky and plastic clay. The next 6 inches is dark red, very sticky and very plastic clay. The lower 15 inches is dark reddish brown, very sticky and very plastic clay. The substratum is reddish brown and pinkish gray shaly clay 8 inches thick. Weak red, yellowish red, and light olive brown calcareous shale is at a depth of 38 inches.

Included with these soils in mapping are a few small areas of Coolville soils. Also included are a few small areas of gently sloping soils and moderately eroded soils.

Permeability is moderate in the subsoil of the Gilpin soil and slow in the subsoil and substratum of the Upshur soil. The available water capacity is moderate in the Gilpin soil and moderate to high in the Upshur soil. The root zone of some plants is restricted by bedrock in the Gilpin soil at a depth of 20 to 40 inches. In unlimed areas the Gilpin soil is strongly acid to very strongly acid throughout, and the Upshur soil is strongly acid or slightly acid in the upper part of the subsoil and medium acid to neutral in the lower part. Runoff is rapid. Natural fertility is low to moderate in the Gilpin soil and moderately high in the Upshur soil. The Upshur soil has a high shrink-swell potential in the subsoil. Depth to bedrock ranges from 34 to 50 inches in the Upshur soil.

This complex is used mainly for hay, pasture, or woodland. Some areas are idle. The soils of this complex have poor potential for cultivated crops, fair potential for hay, and good potential for pasture and trees. Potential for most nonfarm uses is fair to poor.

The soils of this complex are poorly suited to commonly grown cultivated crops. The hazard of erosion is the main limitation. The soils are better suited to hay and pasture or trees. If the soils are cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soils, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

These soils are suitable for trees. The main concerns in woodland management are the erosion hazard; plant com-

petition to pines and hardwoods from undesirable woody plants, grasses, and weeds; and equipment limitations caused by the clayey subsoil of the Upshur soil.

The Gilpin soil in this complex is limited for many nonfarm uses by depth to bedrock. The Upshur soil is limited for most nonfarm uses by high shrink-swell potential, low strength, slow permeability, and a slip hazard. Removal of vegetative cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IVe.

GsD3—Gilpin-Upshur complex, 20 to 30 percent slopes, severely eroded. This complex consists of moderately steep, well drained, moderately deep and deep soils on narrow ridgetops and benches. Areas of these soils are mainly elongated. They range from about 5 to more than 350 acres. These soils are so intermingled on the landscape that mapping them separately was impractical. Soil slips and shallow gullies are in some areas of this complex. This complex is about 50 percent Gilpin silt loam, 35 percent Upshur silty clay loam, and 15 percent other soils.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 4 inches thick. The subsoil extends to a depth of 25 inches. The upper 3 inches is yellowish brown, very friable silt loam. The next 4 inches is yellowish brown, friable silty clay loam. The next 8 inches is strong brown, friable channery silty clay loam. The lower 6 inches is strong brown, friable channery light silty clay loam. The substratum is strong brown very channery heavy silt loam 7 inches thick. Bedrock is at a depth of 32 inches.

Typically, the surface layer of the Upshur soil is reddish brown silty clay loam about 4 inches thick. The subsoil is firm and extends to a depth of 28 inches. The upper 5 inches is dark reddish brown, sticky and plastic clay. The next 6 inches is dark red, very sticky and very plastic clay. The lower 13 inches is dark reddish brown, very sticky and very plastic clay. The substratum is reddish brown and pinkish gray shaly clay 8 inches thick. Weak red, yellowish red, and light olive brown calcareous shale is at a depth of 36 inches.

Included with these soils in mapping are a few small areas of Coolville soils. Also included are a few small areas of Vincent and Allegheny soils in the western part of the county, soils that have a higher sand content, moderately eroded soils, very severely eroded soils, and stony soils.

Permeability is moderate in the subsoil of the Gilpin soil and slow in the subsoil and substratum of the Upshur soil. Available water capacity is moderate in the Gilpin soil and moderate to high in the Upshur soil. In the Gilpin soil the root zone of some plants is restricted by bedrock, which is at a depth of 20 to 40 inches. In unlimed areas, the Gilpin soil is strongly acid to very strongly acid throughout and the Upshur soil is strongly acid or slightly acid in the upper part of the subsoil and medium acid to neutral in the lower part. Runoff is rapid. Natural fertility is low to moderate in the Gilpin soil and moderately high in the Upshur soil. The Upshur soil has a high shrink-swell potential in the subsoil. Depth to bedrock ranges from 34 to 50 inches in the Upshur soil.

This complex is used mainly for pasture or woodland. Some areas are idle. The soils of this complex have poor potential for cultivated crops and hay, fair potential for pasture, and good potential for trees. Potential for most nonfarm uses is poor.

The soils of this complex are not suited to commonly grown cultivated crops because of the severe erosion hazard. The soils are better suited to hay, pasture, or trees. Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

These soils are suitable for trees. The main woodland management concerns are the erosion hazard, equipment limitations, and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

The Gilpin soil in this complex is limited for most nonfarm uses by slope and depth to bedrock. The Upshur soil is limited for most nonfarm uses by slope, high shrink-swell potential, low strength, slow permeability, and a slip hazard. Removal of vegetative cover should be minimal at construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass VIe.

GUE3—Gilpin-Upshur complex, steep, severely eroded. This complex consists of steep, well drained, moderately deep and deep soils on narrow ridgetops, benches, and side slopes. Slopes range from 30 to 40 percent. Areas of these soils are commonly elongated on the ridgetops and benches and are generally irregular in shape and larger on the side slopes. The areas range from about 5 to more than 200 acres. These soils are so intermingled on the landscape that mapping them separately was impractical. Soil slips are in some areas of this complex. Shallow gullies, rock outcrops, and bedrock escarpments are common in some areas. This complex is about 50 percent Gilpin silt loam, 25 percent Upshur silty clay loam, and 25 percent other soils.

Typically, the Gilpin soil has a mat of leaf litter 3 inches thick that covers the surface. The surface layer is dark grayish brown and brown to dark brown silt loam 3 inches thick. The subsoil extends to a depth of 27 inches. The upper 5 inches is yellowish brown, very friable silt loam. The next 4 inches is yellowish brown, friable silty clay loam. The next 8 inches is strong brown, friable channery silty clay loam. The lower 7 inches is strong brown, friable channery light silty clay loam. The substratum is strong brown very channery heavy silt loam 4 inches thick. Bedrock is at a depth of 31 inches.

Typically, the surface layer of the Upshur soil is reddish brown silty clay loam about 3 inches thick. The sub-

soil is firm and extends to a depth of 27 inches. The upper 5 inches is dark reddish brown, sticky and plastic clay. The next 6 inches is dark red, very sticky and very plastic clay. The lower 13 inches is dark reddish brown, very sticky and very plastic clay. The substratum is reddish brown and pinkish gray shaly clay 7 inches thick. Weak red, yellowish red, and light olive brown calcareous shale is at a depth of 34 inches.

Included with these soils in mapping are areas that are as much as 10 acres of well drained Clymer, Dekalb, and Vandalia soils and of soils that have a very channery subsoil, less eroded soils, very severely eroded soils, and very stony soils.

Permeability is moderate in the subsoil of the Gilpin soil and slow in the subsoil and substratum of the Upshur soil. Available water capacity is moderate in the Gilpin soil and moderate to high in the Upshur soil. In the Gilpin soil the root zone of some plants is restricted by bedrock, which is at a depth of 20 to 40 inches. In unlimed areas, the Gilpin soil is strongly acid to very strongly acid throughout and the Upshur soil is strongly acid or slightly acid in the upper part of the subsoil and medium acid to neutral in the lower part. Runoff is rapid. Natural fertility is low to moderate in the Gilpin soil and moderately high in the Upshur soil. The Upshur soil has a high shrink-swell potential in the subsoil. Depth to bedrock ranges from 34 to 50 inches in the Upshur soil.

This complex is used mainly for woodland. Some areas are used for pasture or are idle. The soils of this complex have poor potential for hay and pasture and fair potential for trees. Potential for most nonfarm uses is poor.

The soils of this complex are unsuited to cultivated crops, hay, or pasture because of very steep slopes and a very severe erosion hazard. The soils are better suited to woodland.

This complex is suitable for trees. The main woodland management concerns are the erosion hazard, equipment limitations, and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

The Gilpin soil is limited for most nonfarm uses by slope and depth to bedrock. The Upshur soil is limited for most nonfarm uses by slope, high shrink-swell potential, low strength, slow permeability, and a slip hazard. Removal of plant cover from these soils should be minimal. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass VIIe.

HaA—Hackers silt loam, 0 to 3 percent slopes. This nearly level, well drained, deep soil is on high flood plains. Slopes are smooth and mainly convex. Areas of this soil are mainly elongated and are parallel to a stream. The areas range from about 5 to 50 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is friable and extends to a depth of 60 inches or more. The upper 4 inches is reddish brown silt loam. The next 37 inches is yellowish red light silty clay loam. The lower 12 inches or more is reddish brown silty clay loam.

Included with this soil in mapping are a few small areas of Kanawha and Senecaville soils. Included soils make up about 10 percent of this map unit.

Permeability is moderate in the subsoil. Available water capacity is high. In unlimed areas the soil is medium acid to strongly acid throughout. Runoff is slow to medium. Natural fertility is moderate to high. Bedrock is mainly at a depth of more than 5 feet. This soil is subject to rare flooding.

This soil is used mainly for hay or pasture. In some places it is used for cultivated crops, trees, or homesites. Potential for most nonfarm uses is good to fair.

This soil is well suited to commonly grown cultivated crops and to hay and pasture. Cultivated crops can be grown continuously. Using cover crops and incorporating crop residue into the soil help to maintain fertility. Crops are damaged rarely by flooding in some areas.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees, but very few acres are wooded. The main concern in woodland management is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by flooding and low strength. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability class I.

HaB—Hackers silt loam, 3 to 8 percent slopes. This gently sloping, well drained, deep soil is on high flood plains. Slopes are smooth and mainly convex. Areas of this soil are mainly elongated and are parallel to a stream. They range from about 5 to 20 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is friable and extends to a depth of 60 inches or more. The upper 4 inches is reddish brown silt loam. The next 37 inches is yellowish red light silty clay loam. The lower 12 inches or more is reddish brown silty clay loam.

Included with this soil in mapping are a few small areas of Kanawha soils. Included soils make up about 10 percent of this map unit.

Permeability is moderate in the subsoil. Available water capacity is high. In unlimed areas the soil is medium acid to strongly acid throughout. Runoff is medium. The hazard of erosion is moderate. Natural fertility is moderate to high. Bedrock is mainly at a depth of more than 5 feet. This soil is subject to rare flooding.

This soil is used mainly for hay or pasture. In places it is used for cultivated crops or homesites. This soil has good potential for cultivated crops, hay, pasture, and trees. Potential for most nonfarm uses is good to fair.

This soil is suited to commonly grown cultivated crops, hay, and pasture. The erosion hazard is a management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, and returning crop residue to the soil are practices that help control erosion and maintain fertility and tilth. Crops are damaged rarely by flooding in some areas.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees, but very few areas are wooded. The main concern of woodland management is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by flooding and low strength. Removal of vegetative cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIe.

KaA—Kanawha fine sandy loam, 0 to 3 percent slopes. This nearly level, well drained, deep soil is on high flood plains. Slopes are smooth and mainly convex. Areas of this soil are mainly elongated. They range from about 5 to 50 acres.

Typically, the surface layer is dark brown fine sandy loam about 9 inches thick. The subsoil is friable and extends to a depth of 52 inches. The upper 7 inches is a dark yellowish brown fine sandy loam. The next 12 inches is dark yellowish brown heavy loam. The lower 24 inches is dark brown and dark yellowish brown loam. The substratum is dark yellowish brown fine sandy loam with grayish brown mottles. It extends to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Hackers and Cotaco soils. Also included are a few small areas of soils that have a high sand content, gently sloping soils, and soils that are strongly acid in the lower part of the subsoil and in the substratum. Included soils make up about 15 percent of this map unit.

Permeability is moderate in the subsoil of this soil. Available water capacity is high. In unlimed areas the soil is medium acid to strongly acid in the surface layer and upper part of the subsoil. It is slightly acid to medium acid in the lower part of the subsoil and in the substratum. Runoff is slow to medium. Natural fertility is moderate. Bedrock is generally at a depth of more than 6 feet. This soil is subject to rare flooding.

This soil is mainly used for homesites, hay, or pasture. Some areas are idle. This soil has good potential for cultivated crops, hay, pasture, and trees. Potential for most nonfarm uses is good to fair.

This soil is well suited to commonly grown cultivated crops, hay, and pasture. Cultivated crops can be grown continuously. Using cover crops and incorporating crop residue into the soil help to maintain fertility. Crops are damaged rarely by flooding in some places.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees, but very few areas are wooded. The main concern in woodland management is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by flooding and low strength. Removal of vegetative cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability class I.

KaB—Kanawha fine sandy loam, 3 to 8 percent slopes. This gently sloping, well drained, deep soil is on high flood plains. Slopes are smooth and convex. Areas of this soil are mainly elongated. They range from about 5 to 30 acres.

Typically, the surface layer is dark brown fine sandy loam about 8 inches thick. The subsoil is friable and extends to a depth of 50 inches. The upper 7 inches is a dark yellowish brown fine sandy loam. The next 12 inches is dark yellowish brown heavy loam. The next 16 inches is dark brown loam. The lower 7 inches is dark yellowish brown loam. The substratum is dark yellowish brown fine sandy loam with grayish brown mottles. It extends to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Cotaco soils and a soil that has a surface layer and subsoil high in sand content. Also included are a few small areas of moderately eroded soils and steep soils. Included soils make up about 15 percent of this map unit.

Permeability is moderate in the subsoil of this soil. Available water capacity is high. In unlimed areas the soil is medium acid to strongly acid in the surface layer and the upper part of the subsoil. It is slightly acid to medium acid in the lower part of the subsoil and in the substratum. Runoff is medium. The hazard of erosion is moderate. Natural fertility is moderate. Bedrock is generally at a depth of more than 6 feet. This soil is subject to rare flooding.

This soil is mainly used for homesites, hay, or pasture. Some areas are idle. This soil has good potential for cultivated crops, hay, pasture, and trees. Potential for most nonfarm uses is good to fair.

This soil is suited to commonly grown cultivated crops, hay, and pasture. The erosion hazard is a management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, and returning crop residue to the soil help to control erosion and maintain fertility and tilth. Crops are damaged rarely by flooding in some areas.

Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees, but very few areas are wooded. The main concern in woodland management is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by flooding and low strength. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIe.

LaD—Laidig channery sandy loam, 15 to 25 percent slopes. This moderately steep, well drained, deep soil is on foot slopes and around stream heads. The areas on foot slopes are generally long and narrow and are commonly dissected by drainageways. The areas at the stream heads are irregularly shaped. These areas range from about 5 to 120 acres. Slopes are generally concave. Soil slips are common in some areas.

Typically, the surface layer is very dark grayish brown and dark brown channery sandy loam 10 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is 4 inches of yellowish brown, friable light loam; 12 inches of dark yellowish brown, friable channery loam; 20 inches of brown to dark brown and dark yellowish brown, firm channery loam with brown mottles; and 6 inches of a firm, brittle fragipan of dark yellowish brown channery loam with brown mottles over mixed light brownish gray and strong brown channery loam.

Included with this soil in mapping are a few small areas of Clymer and Dekalb soils. Also included are a few small areas of soils that have a high silt content, severely eroded soils, moderately well drained soils, very stony soils, and steep soils. Included soils make up about 15 percent of this map unit.

Permeability is moderately slow in the fragipan and moderate to moderately rapid above the fragipan. Available water capacity is moderate. The root zone of some plants is restricted in places by the fragipan. In unlimed areas this soil is strongly acid to very strongly acid throughout. Runoff is rapid. Natural fertility is low to moderate. Bedrock is mainly at a depth of more than 5 feet. A seasonal high water table is at a depth of 30 to 48 inches. This soil is subject to soil slips.

This soil is used mostly for woodland. Some areas are used for homesites or are idle. This soil has poor potential for cultivated crops, fair potential for hay and pasture, and good potential for trees.

This soil is limited for cultivated crops by erosion. The soil is better suited to hay and pasture. If the soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, maintaining grassed waterways, and seeding severely eroded areas to a permanent cover help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. A moderate acreage is wooded. The main concerns in woodland management are equipment limitations and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by slope, a seasonal high water table, moderately slow permeability, and a slip hazard. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IVe.

LaE—Laidig channery sandy loam, 25 to 35 percent slopes. This steep, well drained, deep soil is on foot slopes and around stream heads. The areas on foot slopes are generally long and narrow and are commonly dissected by drainageways. The areas around stream heads are irregularly shaped. Areas range from about 5 to 115 acres. Slopes are generally concave. Soil slips are common in some areas.

Typically, the surface layer is very dark grayish brown and dark brown channery sandy loam 9 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is 4 inches of yellowish brown, friable light loam; 12 inches of dark yellowish brown, friable channery loam; 20 inches of brown to dark brown and dark yellowish brown, firm channery loam with brown mottles; and 6 inches of a firm, brittle fragipan of dark yellowish brown channery loam with brown mottles over mixed light brownish gray and strong brown channery loam.

Included with this soil in mapping are a few small areas of Clymer and Dekalb soils. Also included are a few small areas of soils that have a high silt content, very steep soils, very stony soils, moderately well drained soils, and severely eroded soils. Included soils make up about 15 percent of this map unit.

Permeability is moderately slow in the fragipan and moderate to moderately rapid above the fragipan. Available water capacity is moderate. The root zone of some plants is restricted in places by the fragipan. In unlimed areas this soil is strongly acid to very strongly acid throughout. Runoff is rapid. Natural fertility is low to moderate. The hazard of erosion is very severe. Bedrock is mainly at a depth of more than 5 feet. A seasonal high water table is at a depth of 30 to 48 inches. This soil is subject to soil slips.

This soil is used mostly for woodland. Some areas are idle. This soil has poor potential for hay, fair potential for

pasture, and good potential for trees. Potential for most nonfarm uses is poor.

This soil is unsuited to commonly grown cultivated crops because of steep slopes and a very severe erosion hazard. The soil is better suited to permanent pasture or trees.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and seeding severely eroded areas to a permanent plant cover are suitable pasture management practices.

This soil is suitable for trees. A moderate acreage is wooded. The main concerns in woodland management are equipment limitations and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by slope, a seasonal high water table, moderately slow permeability, and a slip hazard. Removal of plant cover should be minimal on this soil. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass VIe.

LdB—Laidig channery loam, 3 to 8 percent slopes. This gently sloping, well drained, deep soil is on lower foot slopes, along alluvial fans, and adjacent to drainageways. Slopes are mainly smooth and concave. Areas of this soil are generally irregularly shaped to triangular near alluvial fans and are long and narrow where adjacent to drainageways. These areas range from about 5 to 35 acres.

Typically, the surface layer is very dark grayish brown and dark brown channery loam 12 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is 4 inches of yellowish brown, friable loam; 12 inches of dark yellowish brown, friable channery loam; 20 inches of brown to dark brown and dark yellowish brown, firm channery loam with brown mottles; and 6 inches of a firm, brittle fragipan of dark yellowish brown channery loam with brown mottles over mixed light brownish gray and strong brown channery loam.

Included with this soil in mapping are a few small areas of Udifluvents, gravelly, and Udifluvents, loamy. Also included are a few small areas of moderately well drained soils, finer textured soils, and very stony soils. Seep spots are in some areas of this soil. In some areas where surface or subsurface mining has occurred, this soil has mine spoil materials consisting of coal and rock fragments in the upper layers. Included soils make up about 15 percent of this map unit.

Permeability is moderately slow in the fragipan and moderate to moderately rapid above the pan. Available water capacity is moderate. The root zone of some plants is restricted in places by the fragipan. In unlimed areas this soil is strongly acid to very strongly acid throughout. The hazard of erosion is moderate. Runoff is medium. Natural fertility is low to moderate. Bedrock is mainly at a depth of more than 5 feet. A seasonal high water table is at a depth of 30 to 48 inches.

This soil is used mostly for woodland or homesites. Some areas are idle. This soil has good potential for crops, hay, pasture, and trees. Potential for most nonfarm uses is good to fair.

This soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is a management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, and returning crop residue to the soil help to control erosion and maintain fertility and tilth.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. A moderate acreage is wooded. The main woodland management concern is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for some nonfarm uses by a seasonal high water table and moderately slow permeability. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIe.

LdC—Laidig channery loam, 8 to 15 percent slopes. This strongly sloping, well drained, deep soil is on lower foot slopes. Some areas are long and narrow, and others are oval to irregularly shaped. Slopes are mainly smooth and convex but are dissected by drainageways in some areas. Areas range from about 5 to 65 acres.

Typically, the surface layer is very dark grayish brown and dark brown channery loam 11 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is 4 inches of yellowish brown, friable loam; 12 inches of dark yellowish brown, friable channery loam; 20 inches of brown to dark brown and dark yellowish brown, firm channery loam with brown mottles; and 6 inches of a firm, brittle fragipan of dark yellowish brown channery loam with brown mottles over mixed light brownish gray and strong brown channery loam.

Included with this soil in mapping are a few small areas of Udifluvents, gravelly, and Udifluvents, loamy. Also included are a few small areas of soils that have a high silt content, moderately well drained soils, severely eroded soils, and very stony soils. Seep spots are in some areas of this soil. Included soils make up about 15 percent of this map unit.

Permeability is moderately slow in the fragipan of this soil and moderate to moderately rapid above the fragipan. Available water capacity is moderate. The root zone of some plants is restricted in places by the fragipan. In unlimed areas this soil is strongly acid to very strongly acid throughout. The hazard of erosion is moderate. Runoff is rapid. Natural fertility is low to moderate. A seasonal

high water table is at a depth of 30 to 48 inches. Bedrock is mainly at a depth of more than 5 feet.

This soil is used mostly for woodland. Some areas are used for homesites or are idle. This soil has fair potential for cultivated crops and good potential for hay, pasture, and trees. Potential for most nonfarm uses is fair.

This soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is a major management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. A moderate acreage is wooded. The main woodland management concern is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for many nonfarm uses by slope, a seasonal high water table, and moderately slow permeability. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIIe.

MgB—Monongahela silt loam, 3 to 8 percent slopes. This gently sloping, moderately well drained, deep soil is on broad stream terraces above flood plains. Slopes are mainly smooth and convex. Areas of this soil are mainly irregular in shape or elongated. They range from about 5 to 35 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil extends to a depth of 50 inches. In sequence downward, it is 3 inches of yellowish brown, very friable silt loam; 16 inches of yellowish brown, friable heavy silt loam with light brownish gray mottles in the lower part; and a fragipan that is 14 inches of yellowish brown, firm heavy silt loam with light brownish gray and strong brown mottles over 10 inches of yellowish brown, very firm silt loam with red and light brownish gray mottles. The substratum is strong brown silt loam with pinkish gray and red mottles. It extends to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Allegheny and Vincent soils. Also included are a few small areas of nearly level soils, soils in which the fragipan is at a depth of more than 30 inches or is absent, and soils that are less than 40 inches deep. Included soils make up about 15 percent of this map unit.

Permeability is moderately slow or slow in the fragipan of this soil and moderate above the fragipan. Available water capacity is moderate. The root zone of some plants is restricted by the seasonal high water table and by the fragipan at a depth of 18 to 30 inches. In unlimed areas this soil is strongly acid to very strongly acid throughout. Runoff is medium. Natural fertility is low to moderate. Bedrock is at a depth of more than 5 feet.

This soil is used for pasture or homesites. Some areas are idle. This soil has good potential for cultivated crops, hay, pasture, and trees. Potential for most nonfarm uses is fair.

This soil is suited to commonly grown cultivated crops, hay, and pasture. The major management concerns are erosion and the seasonal high water table. Stripcropping, using cover crops, including grasses and legumes in the cropping system, and returning crop residue to the soil help to control erosion and maintain fertility and tilth.

Maintaining a mixture of grasses and legumes and preventing overgrazing are the major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees, but few areas are wooded. The main concerns of woodland management are equipment limitations and plant competition to pines from undesirable woody plants, grasses, and weeds.

This soil is limited for many nonfarm uses by a seasonal high water table, moderately slow or slow permeability, and low strength. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIe.

MgC—Monongahela silt loam, 8 to 15 percent slopes. This strongly sloping, moderately well drained, deep soil is on stream terraces above flood plains. Slopes are mainly convex. Areas of this soil are mainly irregularly shaped or elongated. They range from about 5 to 30 acres.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil extends to a depth of 47 inches. In sequence downward, it is 3 inches of yellowish brown, very friable silt loam; 16 inches of yellowish brown, friable heavy silt loam with light brownish gray mottles in the lower part; and a fragipan that is 14 inches of yellowish brown, firm heavy silt loam with light brownish gray and strong brown mottles over 8 inches of yellowish brown, very firm silt loam with red and light brownish gray mottles. The substratum is strong brown silt loam with pinkish gray and red mottles. It extends to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Coolville and Vincent soils. Also included are a few small areas of moderately steep soils, soils with a fine sandy loam or loam surface layer, moderately deep soils, severely eroded soils, and soils in which the fragipan is at a depth of more than 30 inches or is absent. Included soils make up about 15 percent of the map unit.

Permeability is moderately slow or slow in the fragipan of this soil and moderate above the fragipan. Available water capacity is moderate. The root zone of some plants

is restricted by the seasonal high water table and by the fragipan at a depth of 18 to 30 inches. In unlimed areas this soil is strongly acid to very strongly acid throughout. Runoff is rapid. Natural fertility is low to moderate. Bedrock is at a depth of more than 5 feet.

This soil is mainly used for pasture or homesites. Some areas are idle. This soil has fair potential for cultivated crops and good potential for hay, pasture, and trees. The potential for most nonfarm uses is fair.

This soil is suited to commonly grown cultivated crops, hay, and pasture. The major management concerns are erosion and the seasonal high water table. Stripcropping, using cover crops, including grasses and legumes in the cropping system, and returning crop residue to the soil help to control erosion and maintain fertility and tilth.

Maintaining a mixture of grasses and legumes and preventing overgrazing are the major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees, but few areas are wooded. The main concerns in woodland management are equipment limitations, erosion, and plant competition to pines from undesirable woody plants, grasses, and weeds.

This soil is limited for many nonfarm uses by slope, a seasonal high water table, moderately slow or slow permeability, and low strength. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIIe.

Mo—Moshannon silt loam. This nearly level, well drained, deep soil is on flood plains. Slopes are smooth and mainly convex to flat. Areas of this soil are mainly elongated and winding. They range from about 5 to 40 acres.

Typically, the surface layer is dark reddish brown light silt loam about 7 inches thick. The subsoil extends to a depth of 44 inches. The upper 11 inches is reddish brown, friable heavy silt loam. The next 18 inches is reddish brown, friable light silty clay loam. The lower 8 inches is dark reddish brown, friable silt loam. The substratum is reddish brown, friable fine sandy loam with dark reddish brown mottles. It extends to a depth of 66 inches or more.

Included with this soil in mapping are a few small areas of Senecaville, Sensabaugh, and Vandalia soils. Included soils make up about 10 percent of this map unit.

Permeability is moderate, and available water capacity is high. In unlimed areas this soil is slightly acid to medium acid throughout. Runoff is medium or slow. Natural fertility is moderately high. Bedrock is at a depth of more than 5 feet. This soil is subject to common flooding.

This soil is used mainly for cultivated crops, hay, and pasture. Some areas are idle. This soil has good potential for cultivated crops, hay, pasture, and trees. Potential for most nonfarm uses is poor.

This soil is suited to commonly grown cultivated crops, hay, and pasture. Continuous row crops can be grown, but a cover crop is needed to protect the soil from scouring during flooding. Using cover crops and incorporating crop residue into the soil help to maintain fertility. Crops are damaged occasionally by flooding in some areas.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees, but few areas are wooded. The main concern in woodland management is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by flooding. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIw.

Qu—Quarries. This unit consists of open pits or cuts where sandstone and related sedimentary materials have been removed. Vertical high walls on the upslope side of these areas range from 10 to 60 feet in height. Mixed rock and soil material is in some areas of this unit. Quarries are generally near the Kanawha and Elk Rivers or in the vicinity of the major highways in the county. Areas range from about 5 to 25 acres. Capability subclass not assigned.

Se—Senacaville silt loam. This nearly level, moderately well drained, deep soil is on flood plains. Slopes are mainly smooth and flat or concave. Areas of this soil are commonly elongated. They range from about 5 to 30 acres.

Typically, the surface layer is brown to dark brown silt loam about 6 inches thick. The subsoil is friable and extends to a depth of 40 inches. The upper 16 inches is reddish brown silt loam. The lower 18 inches is reddish brown silt loam with strong brown, red, and reddish gray mottles. The substratum is reddish brown silt loam with reddish gray mottles. It extends to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Sensabaugh, Moshannon, and Hackers soils. Also included are a few small areas of somewhat poorly drained soils and areas of wet spots. Included soils make up about 10 percent of this unit.

Permeability is moderate to moderately slow, and available water capacity is high. The root zone of some plants is restricted by the seasonal high water table at a depth of 18 to 30 inches. In unlimed areas this soil is slightly acid to strongly acid throughout. Runoff is medium or slow. Natural fertility is moderate to high. Bedrock is at a depth of more than 4 feet. This soil is mainly subject to common flooding, but some areas on high flood plains adjacent to Hackers soils flood less frequently.

This soil is mainly used for hay, pasture, or cultivated crops. Some areas are idle. This soil has good potential for cultivated crops, hay, pasture, and trees. Potential for most nonfarm uses is poor.

This soil is suited to commonly grown cultivated crops, hay, and pasture (fig. 4). Row crops can be grown continuously if wet areas are drained and a cover crop is used to protect the soil from scouring during flooding. Using cover crops and incorporating crop residue into the soil help to maintain fertility. Crops are damaged occasionally by flooding in some areas.

Maintaining a mixture of grasses and legumes and preventing overgrazing are the major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees, but few areas are wooded. The main concerns of woodland management are equipment limitations and plant competition to pines and hardwoods from woody plants, grasses, and weeds.

This soil is limited for many nonfarm uses by flooding, a seasonal high water table, and moderately slow permeability. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIw.

Sn—Sensabaugh silt loam. This nearly level, well drained, deep soil is on flood plains. Slopes are mainly smooth and are concave to flat. Areas of this soil are commonly elongated. They range from about 5 to 30 acres.

Typically, the surface layer is dark brown and dark reddish brown silt loam 10 inches thick. The subsoil is friable and extends to a depth of 31 inches. The upper 9 inches is reddish brown heavy silt loam. The middle 6 inches is reddish brown silt loam. The lower 6 inches is reddish brown gravelly loam. The substratum extends to a depth of 48 inches or more. It is reddish brown very gravelly loam to gravelly sandy loam.

Included with this soil in mapping are a few small areas of Vandalia and Moshannon soils. Also included are a few small areas of soils that have a loam surface layer, moderately well drained soils, and soils that have a low gravel content. Included soils make up about 15 percent of this map unit.

Permeability is moderate or moderately rapid. Available water capacity is moderate to high. In unlimed areas this soil is medium acid or slightly acid throughout. Runoff is medium to slow. Natural fertility is medium. Bedrock is at a depth of more than 5 feet. This soil is subject to common flooding.

This soil is used mainly for cultivated crops, hay, or pasture. Some areas are idle. This soil has good potential for cultivated crops, hay, pasture, and trees. Potential for most nonfarm uses is poor.

This soil is suited to commonly grown cultivated crops, hay, and pasture. Row crops can be grown continuously, but a cover crop is needed to protect the soil from scouring during flooding. Using cover crops and incorporating crop residue into the soil help to maintain fertility. Crops are damaged occasionally by flooding in some areas.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. However, few areas are wooded. The main concern in woodland management is plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by flooding. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIw.

Ty—Tyler silt loam. This nearly level, somewhat poorly drained, deep soil is on stream terraces. Slopes are mainly smooth and concave. Areas of this soil are generally irregular in shape. They range from about 5 to 60 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. The upper 6 inches is yellowish brown, friable silt loam with pale brown and strong brown mottles. The next 6 inches is yellowish brown, firm heavy silt loam with gray and brown mottles. The lower part is a fragipan of yellowish brown, very firm heavy silt loam and clay loam and has gray and brown mottles.

Included with this soil in mapping are a few small areas of Cotaco soils and Fluvaquents. Also included are a few small areas of soils that have a high sand content. Included soils make up about 15 percent of this map unit.

Permeability is slow to very slow. Available water capacity is moderate to high. The root zone of some plants is restricted by a seasonal high water table at a depth of 6 to 18 inches and by a fragipan at a depth of 18 to 24 inches. In unlimed areas this soil is strongly acid to very strongly acid throughout. Runoff is slow to medium. Natural fertility is moderate to low. Bedrock is at a depth of more than 5 feet.

This soil is mainly used for hay or pasture. Some areas are idle. This soil has fair potential for cultivated crops and good potential for hay, pasture, and trees. Potential for most nonfarm uses is poor.

If drained, this soil is suitable for commonly grown cultivated crops and hay. The major management concern is the seasonal high water table. Using cover crops and incorporating crop residue into the soil help to maintain fertility.

Maintaining a mixture of grasses and legumes and preventing overgrazing and grazing when the soil is wet are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, deferment of grazing in the spring, and

suspension of grazing during the wetter seasons are suitable pasture management practices.

This soil is suitable for trees, but few areas are wooded. The main concerns in woodland management are equipment limitations and plant competition to pines and hardwoods from woody plants, grasses, and weeds.

This soil is limited for many nonfarm uses by a seasonal high water table and slow to very slow permeability. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIIw.

UA—Udifluvents, gravelly. These nearly level, excessively drained to moderately well drained soils are on flood plains. Slopes are mainly smooth and convex and are commonly dissected by abandoned stream channels. Areas of these soils are mainly elongated. They range from about 5 acres to more than 300 acres.

Generally, the surface layer ranges from loamy sand to loam or gravelly loamy sand to gravelly loam. It ranges from very dark grayish brown to yellowish brown and is about 6 to 8 inches thick. The subsurface layers range from gravelly loamy sand to gravelly sandy loam or from very gravelly loamy sand to very gravelly sandy loam. These soils are commonly stratified. Bedrock is generally at a depth of more than 4 feet.

Included with these soils in mapping are areas that are less than 10 acres of Laidig soils and Udifluvents, loamy. Also included are areas of soils that have been disturbed by coal mining operations and that have accumulations of coal fragments in the surface layer or throughout the soil. Included soils make up about 30 percent of this map unit.

Permeability is moderately rapid to rapid. Available water capacity is low to moderate. Runoff is slow. Bedrock is at a depth of more than 4 feet. In unlimed areas these soils are very strongly acid or medium acid throughout. These soils are subject to common flooding.

These soils have poor potential for most cultivated crops. They have good potential for trees and some kinds of wildlife habitat. They have poor potential for most nonfarm uses because of flooding. Areas are mainly idle, but some are used for community development. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass not assigned.

UB—Udifluvents, loamy. These nearly level, excessively drained to moderately well drained soils are on flood plains. Slopes are mainly smooth and convex. Areas of these soils are generally elongated. They range from about 5 to more than 400 acres.

Generally, the surface layer ranges from loamy sand to loam. It is very dark grayish brown to yellowish brown and is about 2 to 9 inches thick. The subsurface layers range from loamy sand to sandy loam or from gravelly loamy sand to gravelly sandy loam. These soils are stratified in some places. Bedrock is generally at a depth of more than 4 feet.

Included with these soils in mapping are areas that are less than 10 acres of Fluvaquents and Udifluvents, gravelly. Also included are areas at higher positions that flood less frequently than Udifluvents, loamy. Included soils make up about 25 percent of this map unit.

Permeability is moderate to moderately rapid. Available water capacity is low to moderate. Runoff is slow. Bedrock is at a depth of more than 4 feet. In unlimed areas these soils are very strongly acid or medium acid throughout. These soils are subject to common flooding.

These soils have fair potential for most cultivated crops. They have good potential for trees and for some kinds of wildlife habitat. They have poor potential for most nonfarm uses because of flooding. Areas are mainly idle, but some are used for community development. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass not assigned.

UC—Udorthents, smoothed-Urban land complex. This complex consists of nearly level to steep, poorly drained to well drained Udorthents, smoothed, and Urban land on uplands, terraces, and flood plains. Areas of this complex are rectangular, circular, or irregular in shape. They range from about 5 to 365 acres. The areas of Udorthents, smoothed, and Urban land are so intermingled or so small that mapping them separately was impractical. This complex is about 50 percent Udorthents, smoothed, 35 percent Urban land, and 15 percent other soils.

The Udorthents, smoothed, part of this complex consists of truncated areas and areas of heterogeneous fill material. The areas have been leveled by cutting the higher parts and filling the lower parts. These areas are used for buildings, shopping centers, roads, and airports. Some areas that were denuded for topsoil are bare and idle. In general, the upland areas are filled with materials similar to the surrounding soils and underlying strata. The areas that are filled are variable in thickness and kind of fill material. Areas of these soils on terraces and flood plains mainly consist of materials transported by man from upland areas.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that obscure and prevent the identification of the soil or soil materials.

Included with this complex in mapping are a few small areas of soils that are similar to the original soil. In upland areas some of the included soils are Gilpin, Upshur, Clymer, or Dekalb soils. On the terraces and flood plains, included are the Tyler, Monongahela, and Kanawha soils. Also included are a few small areas of fly ash and construction debris.

Permeability, available water capacity, runoff, and internal drainage are variable in the Udorthents, smoothed, part of this complex. Some areas of this complex on terraces are underlain by former drainageways that dissected the terrace and drained water from the uplands to

the river. The fertility and available water capacity of these areas depend mainly on the kind and source of the fill material.

The Udorthents, smoothed, part of this complex has poor potential for most uses unless controlled cutting and filling procedures are followed. Most of the fill areas where controlled compaction techniques were not used have poor potential for use as building sites. A detailed onsite investigation is needed to determine the potential and limitations of the Udorthents, smoothed, part of the complex for any use. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass not assigned.

UD—Udorthents, strip mine. These soils consist of heterogeneous soil and rock material resulting from the excavation of coal. They generally are on a contour along hillsides and hilltops and are on a few narrow flood plains where the mine spoil has filled the bottom of a hollow. Some areas are on a nearly vertical high wall, a nearly level to moderately steep bench, and a steep to very steep outslope. Most areas are long and winding, but where the hilltops have been removed, the areas are large and irregular in shape. Areas of this unit range from about 5 to several hundred acres.

The properties and characteristics of this unit are variable, especially where the excavated materials are replaced in sequence. The depth to bedrock is generally more than 3 feet and is deeper on the outslopes. The unit generally consists of loamy soil material that is 30 to 80 percent coarse fragments throughout. Reaction ranges from strongly acid to extremely acid. The acidity is toxic to many plants.

Included with this unit in mapping are a few areas of well drained Clymer, Dekalb, Gilpin, and Laidig soils.

Permeability is variable in this unit. Available water capacity is generally medium to low. Internal drainage and runoff are variable.

Most areas of this unit are subject to settling and have a slip hazard on the outslope area. Therefore, these soils have poor potential for use as building sites. The nearly level to gently sloping areas of this unit have fair potential for revegetation, but topsoil should be stockpiled and returned to the surface. The steep and very steep outslopes have poor potential for most types of vegetation. Detailed onsite investigations of this unit are needed to determine suitable types of vegetation, fertility requirements, and other suitable amendments or practices. Most areas are idle, but a few reclaimed areas are used for woodland, wildlife habitat, and pasture. Capability subclass not assigned.

Uc—Urban land. This unit consists of nearly level areas where more than 85 percent of the surface is covered by asphalt, concrete, buildings, or other impervious materials. Examples are parking lots, shopping and business centers, and industrial complexes. These areas are mainly along the flood plains and terraces of the Kanawha River and along the Elk River and near its confluence with the Kanawha River. The larger areas of this unit make up the business districts of the major cities in the county. Areas range from about 20 to 600 acres.

Included with this unit in mapping are small areas filled with soil material or soil material mixed with brick, rock, concrete, or other construction material. Fly ash has been used in some areas to fill former stream channels that dissected the terrace. Many of these filled areas are covered by urban structures. Also included are some gently sloping areas.

Examination and identification of soils and soillike material in this unit are impractical. Careful onsite investigation is necessary to determine the limitations and potentials. Maintenance of plant cover is needed on areas of this unit that have not been covered by impervious material. Capability subclass not assigned.

Uf—Urban land-Fluvaquents complex. This complex consists of Urban land and nearly level, poorly drained to somewhat poorly drained, deep Fluvaquents on low terraces and flood plains. Areas of this complex are mainly elongated to irregular in shape. They range from about 5 to 90 acres. The areas of Urban land and Fluvaquents are so intermingled or so small that mapping them separately was impractical. This complex is about 55 percent Urban land, 30 percent Fluvaquents, and 15 percent other soils.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that identification was not feasible.

The surface layer of Fluvaquents is dominantly silt loam. It ranges from dark gray to pale brown and is about 7 inches thick. The subsoil ranges from silt loam to silty clay. The substratum ranges from loam to silty clay loam and is stratified in places. The subsoil and substratum are dominantly gray. Bedrock is generally at depths of more than 4 feet.

Included with this complex in mapping are a few small areas of Tyler, Cotaco, and Kanawha soils and Udorthents, smoothed.

Permeability of the Fluvaquents part of this complex is slow to moderate. Available water capacity is moderate to high. Runoff is slow. A seasonal high water table is at a depth of 6 to 18 inches. Bedrock is at a depth of more than 4 feet. In unlimed areas the soils are very strongly acid to neutral throughout. Fluvaquents are subject to rare flooding in most areas. Some areas near the water level are subject to common flooding.

The Fluvaquents part of this complex is mainly used for parks, building sites, lawns, and gardens. Some areas are idle. These soils have fair potential for lawns and gardens and good potential for trees and shrubs. They have fair potential for recreation areas, and potential for most other nonfarm uses is poor.

Water-tolerant perennial plants are suitable for parts of this complex. Onsite investigation is necessary to determine the feasibility of drainage; a lack of suitable outlets is a limitation in places. Erosion is generally not a

major concern on this complex, unless the soils are disturbed and left exposed for a considerable period of time or are used as water courses.

Fluvaquents are limited for many nonfarm uses by flooding, a seasonal high water table, and slow permeability. Maintenance of plant cover is needed on areas of this complex that have not been covered by impervious material. Capability subclass not assigned.

Uk—Urban land-Kanawha complex. This complex consists of Urban land and nearly level, well drained, deep Kanawha soils on high flood plains. Areas of this complex are mainly elongated and rectangular to irregular in shape. They range from about 3 to 400 acres. The areas of Urban land and Kanawha soils are so intermingled or so small that mapping them separately was impractical. This complex is about 65 percent Urban land, 25 percent Kanawha fine sandy loam, and 10 percent other soils.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that identification of the soils was not feasible.

Typically, the surface layer of the Kanawha soil is dark brown fine sandy loam about 9 inches thick. The subsoil is friable and extends to a depth of 52 inches. The upper 7 inches is dark yellowish brown fine sandy loam. The middle 12 inches is dark yellowish brown heavy loam. The lower 24 inches is dark brown and dark yellowish brown loam. The substratum is dark yellowish brown fine sandy loam with grayish brown mottles. It extends to a depth of 60 inches or more.

Included with this complex in mapping are a few small areas of Tyler, Cotaco, and Hackers soils and Fluvaquents. Also included are a few small areas of Udorthents, smoothed, and gently sloping soils.

Permeability is moderate in the subsoil of the Kanawha soil. Available water capacity is moderate to high. In unlimed areas, the Kanawha soil is medium acid to strongly acid in the surface layer and the upper part of the subsoil and is slightly acid to medium acid in the lower part of the subsoil and in the substratum. Runoff is slow to medium. Natural fertility is moderate. Bedrock is generally at a depth of more than 6 feet. This soil is subject to rare flooding.

The Kanawha soil, or open part of the complex, is used for parks, building sites, lawns, and gardens. It has good potential for lawns, vegetable and flower gardens, trees, and shrubs. It has good potential for recreational areas and for most nonfarm uses.

The Kanawha soil is well suited to grasses, flowers, vegetables, trees, and shrubs. Erosion generally is not a major concern on this complex, unless the soils are disturbed and left exposed for a considerable period of time or are used as water courses.

The Kanawha soil is limited for most nonfarm uses by flooding and low strength. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass not assigned.

Ut—Urban land-Tyler complex. This complex consists of Urban land and nearly level, somewhat poorly drained, deep Tyler soils on stream terraces. Areas of this complex are elongated and irregular in shape. They range from about 10 to 300 acres. The areas of Urban land and Tyler soils are so intermingled or so small that mapping them separately was impractical. This complex is about 65 percent Urban land, 20 percent Tyler silt loam, and 15 percent other soils.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that identification of the soils is not feasible.

Typically, the surface layer of the Tyler soil is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is 6 inches of yellowish brown, friable silt loam with pale brown and strong brown mottles; 6 inches of yellowish brown, firm heavy silt loam with gray and brown mottles; and a fragipan that is 17 inches of yellowish brown, very firm heavy silt loam with gray and brown mottles over 23 inches of yellowish brown, very firm clay loam with gray and brown mottles.

Included with this complex in mapping are a few small areas of Kanawha and Cotaco soils. Also included are Fluvaquents and Udorthents, smoothed.

Permeability of the Tyler soil is slow to very slow. Available water capacity is moderate to high. The root zone of some plants is restricted by a seasonal high water table at a depth of 6 to 18 inches and by a fragipan at a depth of 18 to 24 inches. In unlimed areas this soil is strongly acid throughout. Runoff is slow to medium. Natural fertility is moderate to low. Bedrock is at a depth of more than 5 feet.

The Tyler soil in this complex is used for parks, building sites, lawns, and gardens. It has fair potential for lawns and gardens and good potential for trees and shrubs. It has fair potential for recreation areas and poor potential for most other nonfarm uses.

The Tyler soil is suited to grasses, flowers, and vegetables if excess water is removed. It is well suited to trees and shrubs. Water-tolerant perennial plants are suitable for this soil. Drainage is limited by a lack of suitable outlets. Onsite investigation is necessary to determine the feasibility of drainage. Erosion generally is not a major concern on this complex unless the soils are disturbed and left exposed for a considerable period of time or are used as water courses.

The Tyler soil is limited for many nonfarm uses by a seasonal high water table and slow or very slow permeability. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass not assigned.

VaB—Vandalia silt loam, 3 to 8 percent slopes. This gently sloping, well drained, deep soil is on alluvial fans and low foot slopes adjacent to drainageways. Slopes are mainly smooth and convex or concave. The areas of this soil are generally somewhat triangular on the alluvial fans and are long and narrow on the low foot slopes. Areas range from about 5 to 30 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is friable and extends to a depth of 50 inches. The upper 6 inches is reddish brown silty clay loam. The next 16 inches is reddish brown silty clay. The lower 21 inches is reddish brown shaly silty clay. The substratum is dark reddish brown shaly silty clay loam to a depth of 72 inches or more.

Included with this soil in mapping are a few small areas of Vincent, Moshannon, Sensabaugh, and Senecaville soils; soils that have a less red tint and a higher sand content than this Vandalia soil; and soils that are underlain by bedrock at a depth of less than 40 inches. Included soils make up about 15 percent of this map unit.

Permeability is moderately slow or slow in this soil, and available water capacity is moderate to high. In unlimed areas the soil is strongly acid or medium acid in the surface layer and upper part of the subsoil and medium acid or slightly acid in the lower part of the subsoil and in the substratum. Runoff is medium. Natural fertility is moderate to moderately high. Bedrock is generally at a depth of more than 6 feet. The hazard of erosion is moderate. This soil has a high shrink-swell potential.

This soil is mainly used for hay, pasture, or homesites. Some areas are idle. This soil has good potential for cultivated crops, hay, pasture, and trees. Potential for most nonfarm uses is poor.

This soil is suited to commonly grown cultivated crops, hay, and pasture. The erosion hazard in unprotected areas is a management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, and returning crop residue to the soil help to control erosion and maintain fertility.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. A small acreage is wooded. The main concerns in woodland management are equipment limitations, erosion, and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for many nonfarm uses by high shrink-swell potential, low strength, and moderately slow or slow permeability. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIe.

VaC—Vandalia silt loam, 8 to 15 percent slopes. This strongly sloping, well drained, deep soil is on lower foot slopes adjacent to drainageways and is at the heads of streams. Slopes are generally concave. This soil is somewhat triangular or irregular in shape at the heads of streams and is long and narrow on the lower foot slopes. Areas range from about 5 to 30 acres.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is friable and extends to a depth of 49 inches. The upper 6 inches is reddish brown silty clay loam. The next 16 inches is reddish brown silty clay. The lower 21 inches is reddish brown shaly silty clay. The substratum is dark reddish brown shaly silty clay loam to a depth of 72 inches or more.

Included with this soil in mapping are a few small areas of Vincent, Moshannon, Sensabaugh, and Senecaville soils; soils that have a less red tint and a higher sand content than this Vandalia soil; and soils that are underlain by bedrock at a depth of less than 40 inches. Included soils make up about 15 percent of this map unit.

Permeability is moderately slow or slow in this soil, and available water capacity is moderate to high. In unlimed areas the soil is strongly acid or medium acid in the surface layer and upper part of the subsoil and medium acid or slightly acid in the lower part of the subsoil and in the substratum. The hazard of erosion is moderate. Runoff is rapid. Natural fertility is moderately high. Bedrock is generally at a depth of more than 6 feet. This soil has a high shrink-swell potential and is subject to soil slips.

This soil is mainly used for hay, pasture, or homesites. Some areas are idle. This soil has fair potential for cultivated crops and good potential for hay, pasture, and trees. Potential for most nonfarm uses is poor.

This soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard in unprotected areas is a major management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. A small acreage is wooded. The main concerns of woodland management are equipment limitations, erosion, and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by slope, high shrink-swell potential, low strength, moderately slow or slow permeability, and the slip hazard. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIIe.

VaD—Vandalia silt loam, 15 to 25 percent slopes. This moderately steep, well drained, deep soil is on foot slopes and around stream heads. Slopes are generally concave. This soil is in long and narrow areas on the foot slopes and is in irregularly shaped areas at the stream heads. Areas range from about 5 to 35 acres and are commonly dissected by drainageways. Slips are common in some areas.

Typically, the surface layer is dark brown silt loam about 5 inches thick. The subsoil is friable and extends to a depth of 47 inches. The upper 5 inches is reddish brown silty clay loam. The next 16 inches is reddish brown silty clay. The lower 21 inches is reddish brown shaly silty clay. The substratum is dark reddish brown shaly silty clay loam to a depth of 72 inches or more.

Included with this soil in mapping are a few small areas of Udifluvents, loamy; Sensabaugh, Moshannon, Senecaville, and Upshur soils; soils that have a less red tint and a higher sand content than this Vandalia soil; stony soils; and steep soils. Included soils make up about 15 percent of this map unit.

Permeability is moderately slow or slow in this soil, and available water capacity is moderate to high. In unlimed areas the soil is strongly acid or medium acid in the surface layer and upper part of the subsoil and medium acid or slightly acid in the lower part of the subsoil and in the substratum. Runoff is rapid. Natural fertility is moderate to moderately high. Bedrock is generally at a depth of more than 6 feet. This soil has a high shrink-swell potential and is subject to soil slips.

This soil is mainly used for hay, pasture, or woodland. Some areas are idle, and some are used as homesites. This soil has poor potential for cultivated crops, fair potential for hay and pasture, and good potential for trees. Potential for most nonfarm uses is poor.

This soil is poorly suited to commonly grown cultivated crops and is better suited to hay and pasture. The erosion hazard in unprotected areas is the main limitation. If the soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. The main woodland management concerns are erosion, equipment limitations, and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by slope, high shrink-swell potential, low strength, a slip hazard, and moderately slow or slow permeability. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IVe.

VaE—Vandalia silt loam, 25 to 35 percent slopes. This steep, well drained, deep soil is on foot slopes. Slopes are mainly concave. Areas are long and narrow and range from about 5 to 35 acres. They are commonly dissected by drainageways. Slips are common in some areas.

Typically, the surface layer is dark brown silt loam about 4 inches thick. The subsoil is friable and extends to a depth of 45 inches. The upper 4 inches is reddish brown silty clay loam. The next 16 inches is reddish brown silty clay. The lower 21 inches is reddish brown shaly silty clay. The substratum is dark reddish brown shaly silty clay loam to a depth of 72 inches or more.

Included with this soil in mapping are a few small areas of Upshur soils. Also included are a few small areas of soils that have a less red tint and a higher sand content than this Vandalia soil, stony soils, and very steep soils. Included soils make up about 15 percent of this map unit.

Permeability of this soil is moderately slow or slow. Available water capacity is moderate to high. In unlimed areas the soil is strongly acid or medium acid in the surface layer and upper part of the subsoil and medium acid or slightly acid in the lower part of the subsoil and in the substratum. Runoff is rapid. The hazard of erosion is very severe. Natural fertility is moderate to moderately high. Bedrock is generally at a depth of more than 6 feet. This soil has a high shrink-swell potential and is subject to soil slips.

This soil is mainly used for pasture or woodland. Some areas are idle. This soil has poor potential for hay, fair potential for pasture, and good potential for trees.

This soil is not suited to commonly grown cultivated crops. Steep slopes and the erosion hazard in unprotected areas are the main limitations.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. Many areas are wooded. The main woodland management concerns are erosion, equipment limitations, and plant competition to pines and hardwoods from woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by slope, high shrink-swell potential, low strength, the slip hazard, and moderately slow or slow permeability. Removal of plant cover from this soil should be minimal. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass VIe.

VdC3—Vandalia silty clay loam, 8 to 15 percent slopes, severely eroded. This strongly sloping, well drained, deep soil is on lower foot slopes, adjacent to drainageways, and at the heads of streams. Areas at the stream heads are somewhat triangular or irregular in shape, and areas on the lower foot slopes and adjacent to drainageways are long and narrow. Areas range from about 5 to 25 acres.

Typically, the surface layer is dark reddish brown silty clay loam about 5 inches thick. The subsoil is friable and extends to a depth of 42 inches. The upper 16 inches is reddish brown silty clay. The lower 21 inches is reddish brown shaly silty clay. The substratum is dark reddish brown shaly silty clay loam to a depth of 72 inches or more.

Included with this soil in mapping are a few small areas of Sensabaugh and Upshur soils. Also included are a few small areas of soils that have a less red tint and higher sand content than this Vandalia soil. Included soils make up about 15 percent of this map unit.

Permeability of this soil is moderately slow or slow. Available water capacity is moderate to high. In unlimed areas the soil is strongly acid or medium acid in the surface layer and upper part of the subsoil and medium acid or slightly acid in the lower part of the subsoil and in the substratum. Runoff is rapid. Natural fertility is moderate to moderately high. Bedrock is generally at a depth of more than 6 feet. This soil has a high shrink-swell potential and is subject to soil slips.

This soil is mainly used for hay, pasture, or homesites. Some areas are idle. This soil has poor potential for cultivated crops, fair potential for hay, and good potential for pasture and trees. Potential for most nonfarm uses is poor.

This soil is poorly suited to commonly grown cultivated crops. Erosion is the main limitation. The soil is better suited to hay and pasture. If the soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. A small acreage is wooded. The main concerns of woodland management are equipment limitations, erosion, and plant competition to pines and hardwoods from woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by slope, high shrink-swell potential, low strength, the slip hazard, and moderately slow or slow permeability. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IVe.

VdD3—Vandalia silty clay loam, 15 to 25 percent slopes, severely eroded. This moderately steep, well drained, deep soil is on foot slopes and around stream heads. Slopes are generally convex. Areas on foot slopes are long and narrow, and areas at the stream heads are irregular in shape. Areas range from about 5 to 35 acres and are commonly dissected by drainageways. Soil slips are common in some areas.

Typically, the surface layer is dark reddish brown silty clay loam about 4 inches thick. The subsoil is friable and extends to a depth of 41 inches. The upper 16 inches is reddish brown silty clay. The lower 21 inches is reddish brown shaly silty clay. The substratum is dark reddish brown shaly silty clay loam to a depth of 72 inches or more.

Included with this soil in mapping are a few small areas of Upshur soils. Also included are a few small areas of Allegheny soils, soils that have a less red tint and a higher sand content than this Vandalia soil, stony soils, and steep soils. Included soils make up about 15 percent of this map unit.

Permeability of this soil is moderately slow or slow. Available water capacity is moderate to high. In unlimed areas the soil is strongly acid or medium acid in the surface layer and upper part of the subsoil and medium acid or slightly acid in the lower part of the subsoil and in the substratum. Runoff is rapid. Natural fertility is moderate to moderately high. Bedrock is generally at a depth of more than 6 feet. This soil has a high shrink-swell potential and is subject to soil slips.

This soil is mainly used for pasture or woodland. Some areas are idle. This soil has poor potential for cultivated crops and hay, fair potential for pasture, and good potential for trees. Potential for most nonfarm uses is poor.

This soil is not suited to commonly grown cultivated crops. Slope and erosion are the major limitations.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species and rotation of pastures help to reduce runoff and control erosion.

This soil is suitable for trees. The main woodland management concerns are erosion, equipment limitations, and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by slope, high shrink-swell potential, low strength, the slip hazard, and moderately slow or slow permeability. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass VIe.

VdE3—Vandalia silty clay loam, 25 to 35 percent slopes, severely eroded. This steep, well drained, deep soil is on foot slopes. Slopes are concave. Areas are long and narrow and range from about 5 to 70 acres. They are commonly dissected by drainageways. Soil slips are common in some areas.

Typically, the surface layer is dark reddish brown silty clay loam about 3 inches thick. The subsoil is friable and extends to a depth of 40 inches. The upper 16 inches is reddish brown silty clay. The lower 21 inches is reddish brown shaly silty clay. The substratum is dark reddish brown shaly silty clay loam to a depth of 72 inches or more.

Included with this soil in mapping are a few small areas of Upshur soils, soils that have a less red tint and a higher sand content than this Vandalia soil, and stony soils. Included soils make up about 15 percent of this map unit.

Permeability of this soil is moderately slow or slow. Available water capacity is moderate to high. In unlimed areas the soil is strongly acid or medium acid in the surface layer and upper part of the subsoil and medium acid or slightly acid in the lower part of the subsoil and in the substratum. Runoff is rapid. Natural fertility is moderate to moderately high. Bedrock is generally at a depth of more than 6 feet. This soil has a high shrink-swell potential and is subject to soil slips.

This soil is mainly used for pasture or woodland. Some areas are idle. This soil has poor potential for hay and pasture and fair potential for trees. Potential for most nonfarm uses is poor.

This soil is not suited to cultivated crops, hay, or pasture. Slope and erosion are the major limitations.

This soil is suitable for trees. Most areas are wooded. The main woodland management concerns are erosion, equipment limitations, and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for most nonfarm uses by slope, high shrink-swell potential, low strength, the slip hazard, and moderately slow or slow permeability. Removal of plant cover from this soil should be minimal. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass VIIe.

VeB—Vincent silt loam, 3 to 8 percent slopes. This gently sloping, well drained to moderately well drained, deep soil is mostly on broad terraces above flood plains. Slopes are mainly smooth and convex. Areas are mainly irregular in shape and range from about 5 to 25 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of about 49 inches. The upper 5 inches is strong brown, friable to firm heavy silty clay loam. The next 12 inches is yellowish red, firm silty clay. The lower 24 inches is reddish brown, firm silty clay with light gray clay films in the lower part. The substratum is strong brown and reddish brown silt and clay to a depth of 64 inches or more.

Included with this soil in mapping are a few small areas of Coolville, Upshur, Monongahela, and Allegheny soils. Also included are a few small areas of nearly level soils, soils that are strongly acid to very strongly acid throughout, and moderately deep soils. Included soils make up about 15 percent of this map unit.

Permeability of this soil is slow. Available water capacity is high. In places the root zone of some plants is restricted by a seasonal high water table, which is at a depth of 24 to 72 inches. In unlimed areas this soil is strongly acid to medium acid above the substratum and medium acid to neutral in the substratum. The hazard of erosion is moderate. Runoff is medium. Natural fertility is moderate. Bedrock is generally at a depth of more than 5 feet.

This soil is used mostly for homesites. Some areas are idle. This soil has good potential for cultivated crops, hay, pasture, and trees. Potential for most nonfarm uses is poor.

This soil is suited to commonly grown cultivated crops, hay, and pasture. The erosion hazard in unprotected areas is a management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, and returning crop residue to the soil help to control erosion and maintain fertility and tilth.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. Few areas are wooded. The main concerns in woodland management are equipment limitations, erosion, and plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds.

This soil is limited for many urban uses by a seasonal high water table, slow permeability, moderate shrink-swell potential, and low strength. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIe.

VeC—Vincent silt loam, 8 to 15 percent slopes. This strongly sloping, well drained to moderately well drained, deep soil is mostly on broad terraces above flood plains. Slopes are mainly smooth and convex. Areas of this soil are generally irregular in shape and range from about 5 to 60 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of about 47 inches. The upper 5 inches is strong brown, friable to firm heavy silty clay loam. The next 12 inches is yellowish red, firm silty clay. The lower 22 inches is reddish brown, firm silty clay with light gray clay films in the lower part. The substratum is strong brown and reddish brown silt and clay to a depth of 64 inches or more.

Included with this soil in mapping are a few small areas of Upshur, Allegheny, and Monongahela soils. Also included are a few small areas of severely eroded soils, moderately deep soils, soils that are strongly acid to very strongly acid throughout, and soils that have a higher sand content than this Vincent soil. Included soils make up about 15 percent of this map unit.

Permeability of this soil is slow. Available water capacity is high. In places the root zone of some plants is restricted by the seasonal high water table, which is at a depth of 24 to 72 inches. In unlimed areas this soil is strongly acid to medium acid above the substratum and medium acid to neutral in the substratum. The hazard of

erosion is moderate. Runoff is rapid. Natural fertility is moderate. Bedrock is generally at a depth of more than 5 feet.

This soil is used mostly for homesites. Some areas are idle. This soil has fair potential for cultivated crops and good potential for hay, pasture, and trees. Potential for most nonfarm uses is poor.

This soil is suited to commonly grown cultivated crops, hay, and pasture. The erosion hazard in unprotected areas is a major management concern. If this soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. Few areas are wooded. The main concerns in woodland management are equipment limitations, erosion, and plant competition to pines and hardwoods from woody plants, grasses, and weeds.

This soil is limited for many nonfarm uses by a seasonal high water table, slow permeability, moderate shrink-swell potential, low strength, and slope. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IIIe.

VnC3—Vincent silty clay loam, 8 to 15 percent slopes, severely eroded. This strongly sloping, well drained to moderately well drained, deep soil is mostly on broad terraces above flood plains. Slopes are mainly smooth and convex. Areas of this soil are generally irregular in shape and range from about 5 to 140 acres.

Typically, the surface layer is dark brown silty clay loam about 6 inches thick. The subsoil extends to a depth of about 43 inches. The upper 3 inches is strong brown, friable to firm heavy silty clay loam. The next 12 inches is yellowish red, firm silty clay. The lower 22 inches is reddish brown, firm silty clay with light gray clay films in the lower part. The substratum is strong brown and reddish brown silt and clay to a depth of 64 inches or more.

Included with this soil in mapping are a few small areas of Upshur, Allegheny, and Monongahela soils. Also included are a few small areas of a moderately steep soil, soils that are strongly acid to very strongly acid throughout, and moderately deep soils. Included soils make up about 15 percent of this map unit.

Permeability of this soil is slow. Available water capacity is high. In places the root zone of some plants is restricted by a seasonal high water table, which is at a depth of 24 to 72 inches. In unlimed areas this soil is strongly acid to medium acid above the substratum and medium acid to neutral in the substratum. Runoff is rapid. Natural fertility is moderate. Bedrock is generally at a depth of more than 5 feet.

This soil is used mostly for homesites or is idle. This soil has poor potential for cultivated crops, fair potential for hay, and good potential for pasture and trees. Potential for most nonfarm uses is poor.

This soil is poorly suited to commonly grown cultivated crops. The erosion hazard in unprotected areas is the main limitation. The soil is better suited to hay and pasture. If the soil is cultivated, stripcropping, using cover crops, including grasses and legumes in the cropping system, returning crop residue to the soil, and maintaining grassed waterways help to reduce runoff and control erosion.

Maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Use of proper stocking rates to maintain desirable plant species, rotation of pastures, and deferment of grazing in the spring are suitable pasture management practices.

This soil is suitable for trees. Few areas are wooded. The main concerns in woodland management are equipment limitations, erosion, and plant competition to pines and hardwoods from woody plants, grasses, and weeds.

This soil is limited for many nonfarm uses by a seasonal high water table, slow permeability, low strength, and slope. Removal of plant cover should be minimal on construction sites. Establishing plant cover in unprotected areas and providing for proper surface water disposal help to control erosion and sedimentation. Capability subclass IVe.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, rangeland, and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and

other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

FRANK W. GLOVER, state resource conservationist, Soil Conservation Service, Morgantown, West Virginia, assisted in preparing this section.

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

According to the 1974 Census of Agriculture, 10,485 acres in Kanawha County was used for crops. This was a 16 percent increase in the acreage used for crops in 1969. Of the acreage used for crops in 1974, 7,067 acres was pastured cropland, 2,121 acres was harvested cropland, and 1,297 acres was put to miscellaneous uses.

Corn, oats, and wheat are the major farm crops in the county. Sweet corn, melons, and Irish potatoes are common truck crops. A few small areas are used for tobacco and orchard crops.

Erosion is the major management concern on cropland where slopes are more than 3 percent. Gilpin and Upshur soils on uplands, Vandalia soils on foot slopes, Allegheny and Monongahela soils on terraces, and Kanawha and Hackers soils on high flood plains are the major soils subject to erosion that are used for crops. Erosion causes removal of the surface layer of the soil and causes incorporation of the subsoil and the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, such as Upshur and Vandalia soils. In many areas of gently sloping and strongly sloping Upshur and Vandalia soils, preparing a seedbed and tilling are difficult because the surface layer is eroded.

Erosion control practices provide a protective surface cover, reduce runoff, increase infiltration, and prevent pollution of streams by sediment. A cropping system that keeps plant cover on the soil for extended periods reduces erosion and preserves the productive capacity of soils. The use of forage crops in the cropping system reduces erosion on sloping soils, provides nitrogen, and improves tilth. Clean-tilled crops planted in alternate strips reduce the length of erodible slopes and reduce runoff and minimize erosion. Stripcropping is practical on sloping soils where the topography is sufficiently uniform to permit practical tillage and harvesting operations. The strips are generally on the contour.

Stripcropping and contour tillage are not practical on some of the soils on uplands, such as Upshur and Gilpin soils that have short slopes and that are on narrow ridges or benches. On these soils, cropping systems consisting primarily of a perennial grass and legume cover are needed to control erosion. Leaving crop residue on the surface, either by minimum tillage or stubble mulching, helps to increase infiltration, control runoff, and reduce the hazard of erosion. Sod seeding and no-till farming reduce erosion on sloping soils and can be used on most soils in the county.

Most of the soils used for crops in the county have a silt loam or loam surface layer. Most soils have good tilth. However, the severely eroded soils have a low content of organic matter and have fair or poor tilth.

Commercial crops suited to the soils and climate of the county include many vegetables, small fruits, and nursery plants which are well suited to deep and moderately deep, well drained soils. Examples of such soils are Clymer, Gilpin, and Upshur soils on uplands and Allegheny, Kanawha, Hackers, and Moshannon soils on terraces and flood plains. Orchards on these soils require adequate air drainage.

Drainage of excess water is needed on some soils used for crops and pasture in the county. Tyler, Cotaco, Monongahela, and Senecaville soils need drainage in some areas.

Lime needs to be applied to most soils to obtain optimum results from fertilizer. Crops on most of the arable soils in the county respond well to nitrogen, phosphorus, and potash. The soils on which crops respond particularly well to liming are Clymer and Dekalb soils on uplands, Laidig soils on foot slopes, and Cotaco, Monongahela, and Tyler soils on terraces. These soils generally need lime to reduce acidity and to supply calcium for alfalfa and other

crops that are suited to neutral soils. On all soils the amount of lime and fertilizer used should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields.

Soil test results and information on the management of crops and pasture can be obtained from the West Virginia University Agricultural Extension Service and the local office of the Soil Conservation Service.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forest trees or engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is indicated in table 6. All soils in the survey area except those named at a level higher than the series are included. Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes I and II. Data in this table can be used to determine the farming potential of such soils.

The capability subclass is identified in the description of each soil map unit in the section "Soil maps for detailed planning."

Woodland management and productivity

JOHN L. GORMAN, woodland conservationist, Soil Conservation Service, prepared this section.

Soil properties have a strong influence on occurrence of tree species, tree growth, and woodland management. Differences in soil depth and texture, for example, cause differences in available moisture capacity and thereby influence the occurrence of species and the rate at which trees grow. Other features, such as steepness of slope, stoniness, or a clayey subsoil, also affect woodland management. Aspect, or the direction in which a sloping soil faces, can also have a strong effect on the occurrence of different tree species as well as their growth potential. Plant competition to pines and hardwoods from undesirable woody plants, grasses, and weeds is one of the major woodland management concerns in the county. Generally, plant competition is more severe for pines than for hardwoods.

About 79 percent of Kanawha County, or approximately 460,000 acres, is woodland. With the exception of 6,600 acres in Kanawha State Forest, the woodland is essentially in private ownership.

The rugged half of the county that lies generally southeast of Charleston is nearly 90 percent woodland. The medium textured Clymer and Gilpin soils and the moderately coarse textured Dekalb soils are dominant in this area. The dominant forest types, or natural association of trees, are the white oak-northern red oak-hickory on the south aspects and northern red oak-yellow poplar-white oak on the north aspects. Narrow bands of yellow poplar are along drainageways and foot slopes. The woodland in the area is in large management units, and surface mining for coal is common. The soils in this half of the county have good wood-producing potential, but forest fires are a serious limitation.

The rolling, less rugged half of the county that lies generally northwest of Charleston is about two-thirds woodland. The medium textured Gilpin soils and the fine textured Upshur soils are dominant in the area. The area has many small to medium-sized farms, and many fields have been abandoned to grow back to woody vegetation. The dominant forest type is white oak-red oak-hickory. Yellow-poplar and associated cove hardwoods are along drainageways and colluvial foot slopes. Virginia pine occupies many abandoned fields. The soils generally have fair potential for trees on south aspects and good potential on north aspects, but the demand for housing and use of the soils for part-time farming limit the wood-producing potential of this area.

Table 7 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Map unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *w* indicates excessive water in or on the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: w, d, c, f, and r.

In table 7 the soils are also rated for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of major soil limitations.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if some measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or equipment; *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Considered in the ratings of *windthrow hazard* are characteristics of the soil that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that trees in wooded areas are not expected to be blown down by commonly occurring

winds; *moderate*, that some trees are blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in 50 years. The site index applies to fully stocked, even-aged, unmanaged stands. Site index is listed for trees that woodland managers generally favor in intermediate or improvement cuttings. The trees are selected on the basis of growth rate, quality, value, and marketability. Other trees that commonly occur on the soil are listed regardless of potential value and growth potential.

Trees to plant are those that are suitable for commercial wood production and that are suited to the soils.

Engineering

PAUL S. DUNN, assistant state conservation engineer, assisted in the preparation of this section.

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities; and table 11, for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping are indicated in table 8. A *slight* limitation indicates that soil properties generally are favorable for the specified use. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is

required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 8 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Lawns and landscaping require soils that are suitable for the establishment and maintenance of turf for lawns and ornamental trees and shrubs for landscaping. The best soils are firm after rains, are not dusty when dry, and absorb water readily and hold sufficient moisture for plant growth. The surface layer should be free of stones. If shaping is required, the soils should be thick enough over bedrock or hardpan to allow for necessary grading. In rating the soils, the availability of water for sprinkling is assumed.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 9 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 9 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the surface layer and a depth of 5 to 6 feet. It is assumed that soil layers will be mixed during excavation and spreading. Many soils have layers of contrasting suitability. The estimated engineering properties in table 14 provide specific information about the nature of each layer. This information can help determine the suitability of each layer for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 14.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the surface layer greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface layer is generally preferred for topsoil because of its organic-matter content. This layer is designated as A1 or Ap horizon in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11 the soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 12 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 9, and interpretations for dwellings without basements and for local roads and streets, given in table 8.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or

no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They should have a surface that is free of stones and boulders and have moderate slopes. Suitability of the soil for traps, tees, or greens was not considered in rating the soils. Irrigation is an assumed management practice.

Wildlife habitat

THOMAS C. CREBBS, biologist, Soil Conservation Service, assisted with this section.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 13, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, and wheatgrass.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of

fruit-producing shrubs that are commercially available and suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, and cordgrass and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, and red fox.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major layer of each soil in the survey area. They also present data about pertinent soil and water features.

Engineering properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 14 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the

fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index are estimated on the basis of test data from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Soil and water features

Table 16 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is

described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*6*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or mapping units, of each soil series are described in the section "Soil maps for detailed planning."

Allegheny series

The Allegheny series consists of fine-loamy, mixed, mesic Typic Hapludults. These are deep, well drained soils that have a clay loam B2t horizon. The soils formed in old, acid alluvial material washed from soils on uplands underlain by sandstone, siltstone, and shale. Allegheny soils are on high stream terraces mainly along the Coal and Kanawha Rivers. Slopes range from 3 to 15 percent but are dominantly 8 to 15 percent.

The Allegheny soils are on the landscape with moderately well drained Monongahela soils and well drained to moderately well drained Vincent soils. Allegheny soils are better drained than and do not have the fragipan typical of the Monongahela soils. They have a coarser textured B horizon than Vincent soils.

Typical pedon of Allegheny loam, shale substratum, 8 to 15 percent slopes, in a lawn 25 feet west of a minor road and 800 feet north of Coal River Road, 2 miles north of the Tornado Post Office:

Ap—0 to 9 inches, brown to dark brown (10YR 4/3) loam; weak medium subangular blocky structure parting to weak medium granular; friable; common roots; slightly acid; abrupt wavy boundary.

B21t—9 to 21 inches, yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; friable; common roots; common discontinuous clay films on ped faces; strongly acid; clear wavy boundary.

B22t—21 to 33 inches, strong brown (7.5YR 5/6) clay loam; moderate fine and medium subangular blocky structure; friable; few roots; common discontinuous clay films on ped faces; 10 percent rounded coarse fragments; strongly acid; clear wavy boundary.

B3t—33 to 43 inches, strong brown (7.5YR 5/6) gravelly heavy loam; weak medium subangular blocky structure; friable; few roots; few discontinuous clay films on ped faces; 20 percent rounded coarse fragments; strongly acid; clear wavy boundary.

C—43 to 49 inches, strong brown (7.5YR 5/6) gravelly loam; many distinct light gray (10YR 7/1) mottles; massive; 35 percent soft rounded coarse fragments; strongly acid; clear wavy boundary.

IIC—49 to 66 inches, strong brown (7.5YR 5/6), light gray (10YR 7/1), and dark reddish brown (2.5YR 3/4) soft weathered shale which crushes to silty clay and silty clay loam; medium acid.

IICr—66 inches, weathered shale.

The solum thickness ranges from 30 to 45 inches. Depth to bedrock is generally more than 4 feet. Coarse fragments make up 0 to 10 percent of the A and B2t horizons and as much as 35 percent of the B3 and C horizons. The A, B, and C horizons are strongly acid or very strongly acid unless the soil is limed. The IIC horizon is medium acid.

The Ap horizon has value of 4 or 5 and chroma of 2 through 4.

The B2t horizon has hue of 7.5YR or 10YR and chroma of 4 through 8. It is loam, clay loam, or sandy clay loam.

The B3 and C horizons have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 8. They are clay loam, sandy clay loam, loam, sandy loam, or their gravelly analogues.

The IIC horizon has hue of 2.5YR through 2.5Y, value of 3 through 7, and chroma of 1 through 6. When crushed, the shale is silty clay loam or silty clay.

Clymer series

The Clymer series consists of fine-loamy, mixed, mesic Typic Hapludults. These are deep, well drained soils that have a channery clay loam B2t horizon. The soils formed in acid material weathered from sandstone, siltstone, and interbedded shale. Clymer soils are on ridgetops, benches, and side slopes mostly in the southern half of the county. Slopes range from 10 to 70 percent but are dominantly 40 to 70 percent.

Clymer soils are on the landscape with moderately deep Dekalb soils. They are near well drained Gilpin and Laidig soils and moderately well drained Coolville soils. Clymer soils have a coarser textured profile than the Gilpin or Coolville soils, are deeper than the Gilpin and Dekalb soils, and do not have the fragipan typical of the Laidig soils.

Typical pedon of Clymer channery loam, in an area of Clymer-Dekalb complex, very steep, in a wooded area along the Bee Mountain Lookout Tower Road, 1.2 miles from the fire tower, approximately 3 miles south of Hernshaw:

O1—2-1/2 inches to 1/2 inch, scattered leaf litter.

O2—1/2 inch to 0, decomposed leaf litter.

A1—0 to 1 inch, very dark grayish brown (10YR 3/2) channery loam; weak fine granular structure; very friable; many roots; 15 percent coarse fragments; strongly acid; abrupt wavy boundary.

A2—1 to 4 inches, yellowish brown (10YR 5/4) channery loam; weak fine granular structure; very friable; many roots; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B1—4 to 12 inches, yellowish brown (10YR 5/6) channery loam; weak fine and medium subangular blocky structure; friable; many roots; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B21t—12 to 20 inches, strong brown (7.5YR 5/6) channery clay loam; weak to moderate medium subangular blocky structure; friable, slightly plastic; common roots; common discontinuous clay films on ped faces; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—20 to 32 inches, strong brown (7.5YR 5/6) channery clay loam; moderate medium subangular blocky structure; firm in place but friable when removed; slightly plastic; common discontinuous clay films on ped faces; few roots; 25 percent coarse fragments; strongly acid; clear wavy boundary.

B23t—32 to 37 inches, strong brown (7.5YR 5/6) channery light clay loam; weak to moderate medium subangular blocky structure; firm in place but friable when removed; slightly plastic; few roots; common discontinuous clay films on ped faces; 25 percent coarse fragments; strongly acid; clear wavy boundary.

C—37 to 52 inches, mixed strong brown (7.5YR 5/6) and yellowish red (5YR 5/6) very channery heavy loam; massive; firm; 80 percent coarse fragments; strongly acid; gradual wavy boundary.

R—52 inches, shale and sandstone bedrock.

The solum thickness ranges from 30 to 40 inches. Depth to bedrock ranges from 3-1/2 to 5 feet. Unless limed, the profile is strongly acid or very strongly acid throughout. Coarse fragments make up 5 to 25 percent of the A horizon, 15 to 35 percent of the B horizon, and 40 to 85 percent of the C horizon.

The A1 horizon has value of 2 or 3 and chroma of 1 or 2. The A2 horizon has chroma of 2 through 6. The Ap horizon, where present, has value of 3 through 5 and chroma of 2 or 3. It is channery loam or loam.

The B horizon has hue of 10YR and 7.5YR, value of 5 or 6, and chroma of 4 through 8. It is channery analogues of clay loam, loam, sandy clay loam, or sandy loam.

The C horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 4 through 6. It is channery or very channery analogues of loam, sandy clay loam, or sandy loam.

Coolville series

The Coolville series consists of clayey, mixed, mesic Aquic Hapludults. These are deep, moderately well drained soils in which the upper part of the B2t horizon is silty clay loam, the lower part of the B2t horizon is silty clay, and the B3 horizon is clay. The soils formed in acid material weathered from shale and some siltstone and sandstone. Coolville soils are on ridgetops and benches mainly in the northern half and central part of the county. Slopes range from 3 to 20 percent but are dominantly 10 to 20 percent.

The Coolville soils are on the landscape with well drained Gilpin, Clymer, and Upshur soils. Coolville soils have a higher clay content than Clymer and Gilpin soils and are more strongly acid than Upshur soils. Coolville soils have mottles and variegated red and gray colors that the Gilpin, Clymer, and Upshur soils do not have.

Typical pedon of Coolville silt loam, 3 to 10 percent slopes, in an idle field approximately 100 feet south of Derricks Creek Ridge Road, about 1/4 mile west of former Asbury School site, 3.1 miles northwest of Sissonville:

Ap—0 to 7 inches, dark brown (10YR 4/3) silt loam; moderate medium granular structure; very friable; many roots; strongly acid; abrupt smooth boundary.

B21t—7 to 15 inches, yellowish brown (10YR 5/6) light silty clay loam; moderate medium subangular blocky structure; friable; many roots; few discontinuous clay films on ped faces; strongly acid; clear wavy boundary.

B22t—15 to 22 inches, strong brown (7.5YR 5/6) silty clay loam; few red (2.5YR 4/6) mottles; moderate medium subangular and angular blocky structure; firm; common roots; common yellowish brown (10YR 5/4) discontinuous clay films on ped faces; strongly acid; gradual wavy boundary.

IIB23t—22 to 32 inches, red (2.5YR 4/6) and strong brown (7.5YR 5/6) silty clay; common light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; few roots; continuous clay films on ped faces; very strongly acid; gradual wavy boundary.

IIB3t—32 to 47 inches, red (2.5YR 4/6) clay; common medium and coarse light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure; very firm; few roots; few yellowish red (7.5YR 5/6) discontinuous clay films on ped faces; very strongly acid; abrupt wavy boundary.

IIC—47 to 60 inches, light brownish gray (10YR 6/2) silty clay; common coarse red (2.5YR 4/6) and strong brown (7.5YR 5/6) mottles; massive; very strongly acid; clear wavy boundary.

IICr—60 inches, light olive brown (2.5YR 5/6) soft shale.

The solum thickness ranges from 40 to 50 inches. Depth to bedrock is more than 4 feet. The profile is strongly acid to extremely acid throughout unless limed.

The Ap horizon has value of 4 or 5. It is silt loam or silty clay loam.

The upper part of the Bt horizon has hue of 10YR or 7.5YR. The lower part of the Bt horizon has hue of 2.5YR or 7.5YR and value of 4 or 5. Mottles with chroma of 2 or less and mottles with high chroma are in subhorizons of the upper 24 inches of the Bt horizon. The lower part of the Bt horizon is silty clay or clay.

The C horizon has hue of 2.5YR through 7.5YR, value of 4 through 6, and chroma of 1 through 6. Mottles and streaks range from common to many and have a similar range in hue, value, and chroma. The C horizon is silty clay loam to clay. It has thin layers of sandy loam or loam weathered from thin strata of sandstone.

Cotaco series

The Cotaco series consists of fine-loamy, mixed, mesic Aquic Hapludults. These are deep, moderately well drained soils that have a B2t horizon of yellowish brown sandy clay loam and light clay loam. The soils formed in acid alluvial material washed from soils on uplands underlain by sandstone, siltstone, and shale. Cotaco soils are on low terraces mainly along the Coal and Pocatalico Rivers. Slopes range from 0 to 4 percent.

The Cotaco soils are on the landscape with well drained Kanawha and Hackers soils, moderately well drained Senecaville soils, and somewhat poorly drained Tyler soils. Cotaco soils are not so well drained as Kanawha and Hackers soils, are coarser textured than Senecaville soils, and are better drained than Tyler soils.

Typical pedon of Cotaco loam in a meadow about 350 feet west of Coal River, about 900 feet south of Coal River Bridge, near Tornado:

Ap—0 to 8 inches, dark brown (10YR 4/3) loam; moderate medium granular structure; friable; many roots; 3 percent gravel; strongly acid; abrupt smooth boundary.

B1—8 to 14 inches, dark brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; common roots, 3 percent gravel; very strongly acid; clear wavy boundary.

B21t—14 to 21 inches, yellowish brown (10YR 5/4) sandy clay loam; moderate medium subangular blocky structure; friable to firm; common roots; common discontinuous clay films on ped faces; 3 percent gravel; very strongly acid; clear wavy boundary.

B22t—21 to 28 inches, yellowish brown (10YR 5/4) light clay loam; few medium strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm few roots; common discontinuous clay films on ped faces; few oxide coatings; 3 percent gravel; very strongly acid; clear wavy boundary.

B3t—28 to 44 inches, yellowish brown (10YR 5/4) light clay loam; many coarse yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to subangular blocky; firm; few roots; common discontinuous clay films on ped faces; common oxide coatings; 3 percent gravel; very strongly acid; clear wavy boundary.

C—44 to 60 inches, yellowish brown (10YR 5/4 and 10YR 5/6) and light brownish gray (10YR 6/2) light clay loam; massive; firm; 5 percent gravel; very strongly acid.

The solum thickness ranges from 30 to 48 inches. Depth to bedrock is generally more than 5 feet. Depth to low chroma mottles ranges from 16 to 25 inches. Round coarse fragments make up 2 to 10 percent of the A and B2 horizons and 2 to 30 percent of the B3 and C horizons. The profile is strongly acid to extremely acid throughout unless limed.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3.

The B1 horizon has value of 4 or 5 and chroma of 3 or 4. The B2 and B3 horizons have hue of 5YR, 7.5YR, and 10YR; value of 4 through 6; and chroma of 3 through 6. The B2 horizon is heavy loam, sandy clay loam, or light clay loam.

The B3 and C horizons have hue of 10YR and 7.5YR, value of 5 through 7, and chroma of 2 through 6, or they are mottled evenly with similar hue, value, and chroma. They are heavy loam, sandy clay loam, light clay loam, or their gravelly analogues.

Dekalb series

The Dekalb series consists of loamy-skeletal, mixed, mesic Typic Dystrochrepts. These are moderately deep, well drained soils that have a channery and very channery sandy loam B horizon. The soils formed in acid

material weathered from sandstone and interbedded in places with siltstone and shale. Dekalb soils are on ridgetops, benches, and side slopes mainly in the southern half of the county. Slopes range from 20 to 70 percent but are dominantly 40 to 70 percent.

Dekalb soils are on the landscape with deep Clymer soils and are near well drained Gilpin and Laidig soils. Dekalb soils have a coarser textured profile than Gilpin soils and do not have the fragipan typical of Laidig soils.

Typical pedon of Dekalb channery sandy loam, in an area of Clymer-Dekalb complex, very steep, in a wooded area along the road from Bee Mountain Lookout Tower, about 0.75 mile from the ridgetop, approximately 3 miles south of Hernshaw:

O1—3 inches to 1 inch; leaf litter.
O2—1 inch to 0; decomposed leaf litter.
A1—0 to 1 inch; black (10YR 2/1) channery sandy loam; weak fine granular structure; very friable; many roots; 25 percent coarse fragments; very strongly acid; abrupt smooth boundary.
A2—1 to 3 inches, brown (10YR 5/3) channery sandy loam; weak fine granular structure; very friable; many roots; 25 percent coarse fragments; very strongly acid; abrupt irregular boundary.
B1—3 to 10 inches, pale brown (10YR 6/3) channery sandy loam; weak fine subangular blocky structure; very friable; many roots; 35 percent coarse fragments; very strongly acid; clear wavy boundary.
B2—10 to 20 inches, pale brown (10YR 6/3) channery sandy loam; weak medium subangular blocky structure; firm in place but friable when removed; common roots; 40 percent coarse fragments; very strongly acid; clear wavy boundary.
B3—20 to 30 inches, pale brown (10YR 6/3) very channery sandy loam; weak medium subangular blocky structure; firm in place but friable when removed; few roots; coatings of yellowish red (5YR 5/6) on ped faces; 60 percent coarse fragments; very strongly acid; abrupt irregular boundary.
R—30 inches, sandstone.

Solum thickness ranges from 20 to 40 inches. Depth to bedrock ranges from 20 to 40 inches. The content of coarse fragments commonly increases with depth, making up 15 to 45 percent of the A horizon, 15 to 60 percent of the B horizon, and more than 35 percent of the control section. The profile is very strongly acid to strongly acid throughout unless limed.

The A1 horizon has value of 2 or 3 and chroma of 1 or 2. The A2 horizon has value of 5 or 6 and chroma of 1 through 4.

The B horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 through 6. It is channery or very channery analogues of loam or sandy loam.

Fluvaquents

Fluvaquents consist of deep, poorly drained to somewhat poorly drained soils. They formed in alluvial material derived from sandstone, siltstone, and shale. These soils are mainly on flood plains of the major streams in the county. Slopes range from 0 to 3 percent.

Fluvaquents are on the landscape with well drained Kanawha and Moshannon soils, moderately well drained Cotaco and Senecaville soils, and somewhat poorly drained Tyler soils.

Because of the variability of these soils, a typical pedon is not given. They have a solum that ranges from 20 to 50 inches in thickness. Depth to bedrock is more than 4 feet. Coarse fragments make up 0 to 15 percent of some subhorizons. The soils are very strongly acid to neutral.

The A horizon dominantly has hue of 10YR, value of 4 through 6, and chroma of 1 through 3. It is silt loam and ranges from 4 to 10 inches in thickness.

The B horizon dominantly has hue of 10YR, value of 5 through 7, and chroma of 1 or 2. Subhorizons with chroma of 3 are in some pedons. Mottles generally occur throughout the B horizon. The B horizon ranges from friable to firm and from silt loam to silty clay. It is 10 to 40 inches thick.

The C horizon ranges from loam to silty clay loam and is stratified in places.

Gilpin series

The Gilpin series consists of fine loamy, mixed, mesic Typic Hapludults. These are moderately deep, well drained soils that have a silty clay loam and channery silty clay loam B2t horizon. The soils formed in acid material weathered from interbedded shale, siltstone, and sandstone. Gilpin soils are on ridgetops, benches, and side slopes mainly in the northern half and the central part of the county. Slopes range from 10 to 55 percent but are dominantly 20 to 55 percent.

The Gilpin soils are on the landscape with well drained Clymer, Dekalb, and Upshur soils and moderately well drained Coolville soils. Gilpin soils are near well drained Vandalia and Laidig soils, which are on foot slopes. Gilpin soils have a finer textured profile than the Clymer and Dekalb soils. They are less red, have a coarser textured profile, and are generally more acid than the Upshur or Vandalia soils. They are more shallow and do not have the fragipan typical of the Laidig soils. Gilpin soils are not as deep as the Coolville or Vandalia soils and are better drained than the Coolville soils.

Typical pedon of Gilpin silt loam, 30 to 40 percent slopes, in an area of woodland approximately 0.95 mile northeast of the mouth of Upper King Shoals Run along a jeep trail, about 9.5 miles east of Clendenin:

O1—3 inches to 1 inch, hardwood leaf litter.
O2—1 inch to 0, partly decomposed leaf litter.
Ap1—0 to 3 inches, dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; very friable; many roots; 5 percent coarse fragments; medium acid; clear wavy boundary.
Ap2—3 to 6 inches, brown to dark brown (10YR 4/3) silt loam; weak medium subangular blocky structure parting to moderate medium granular; very friable; many roots; 5 percent coarse fragments; medium acid; clear wavy boundary.
B1—6 to 11 inches, yellowish brown (10YR 5/4) silt loam; moderate fine and medium subangular blocky structure; very friable; many roots; 5 percent coarse fragments; strongly acid; clear wavy boundary.
B21t—11 to 15 inches, yellowish brown (10YR 5/6) silty clay loam; moderate fine and medium subangular blocky structure; friable; common roots; common discontinuous clay films on ped faces; 10 percent coarse fragments; strongly acid; clear wavy boundary.
B22t—15 to 23 inches, strong brown (7.5YR 5/6) channery silty clay loam; moderate fine and medium subangular blocky structure; friable; common roots; common discontinuous clay films on ped faces; 25 percent coarse fragments; strongly acid; clear wavy boundary.
B3—23 to 30 inches, strong brown (7.5YR 5/6) channery light silty clay loam; weak medium subangular blocky structure; friable; common roots; few discontinuous clay films on ped faces; 35 percent coarse fragments; strongly acid; clear wavy boundary.

C—30 to 35 inches, strong brown (7.5YR 5/6) very channery heavy silt loam; massive; friable; few roots; 65 percent coarse fragments; strongly acid; abrupt wavy boundary.
R—35 inches, massive sandstone.

The solum thickness ranges from 20 to 36 inches. Depth to bedrock ranges from 20 to 40 inches. Coarse fragments make up 5 to 35 percent of the B horizon and 30 to 85 percent of the C horizon. The profile is strongly acid to very strongly acid unless limed.

The Ap horizon has value of 3 through 5 and chroma of 2 through 4.

The B horizon has hue of 10YR and 7.5YR and chroma of 4 through 8. It is silt loam, silty clay loam, heavy loam, or their channery or shaly analogues.

The C horizon is loam, silt loam, or their shaly, very shaly, channery, or very channery analogues.

Hackers series

The Hackers series consists of fine-silty, mixed, mesic Typic Hapludalfs. These are deep, well drained soils that have a silty clay loam B2t horizon. The soils formed in lime-influenced alluvial material washed from soils on uplands underlain by shale, siltstone, and sandstone. Hackers soils are on high flood plains mainly near the Pocatalico and Elk Rivers and Big Sandy and Little Sandy Creeks. Slopes range from 0 to 8 percent but are dominantly 0 to 3 percent.

Hackers soils are on the landscape with moderately well drained Senecaville and Cotaco soils and well drained Moshannon soils. Hackers soils are better drained than Senecaville and Cotaco soils and have a more developed profile and are flooded less frequently than Moshannon soils.

Typical pedon of Hackers silt loam, 0 to 3 percent slopes, in a pasture on the east side of Pocatalico River, about 0.8 mile north of Sissonville:

Ap—0 to 7 inches, dark brown (7.5YR 4/4) silt loam; moderate medium granular structure; very friable; many roots; slightly acid; clear wavy boundary.
B1—7 to 11 inches, reddish brown (5YR 4/4) silt loam; weak fine subangular blocky structure; friable; many roots; slightly acid; clear wavy boundary.
B21t—11 to 20 inches, yellowish red (5YR 4/6) light silty clay loam; moderate medium subangular blocky structure; friable; common roots; common discontinuous clay films on ped faces; medium acid; gradual wavy boundary.
B22t—20 to 37 inches, yellowish red (5YR 4/6) light silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; friable; few roots; common discontinuous clay films on ped faces; medium acid; gradual wavy boundary.
B23t—37 to 48 inches, yellowish red (5YR 4/6) silty clay loam; weak medium and coarse subangular blocky structure; friable; few discontinuous clay films on ped faces; medium acid; gradual wavy boundary.
B3—48 to 60 inches, reddish brown (5YR 4/4) silty clay loam; weak coarse prismatic structure; friable; medium acid.

Solum thickness ranges from 35 to 60 inches or more. Depth to bedrock is generally more than 5 feet. The B horizon is medium acid or strongly acid unless limed.

The Ap horizon has chroma of 2 through 4.

The B horizon has chroma of 4 through 6. It is heavy silt loam or silty clay loam. Thin strata of clay loam are in the lower part of some profiles.

Kanawha series

The Kanawha series consists of fine-loamy, mixed, mesic Typic Hapludalfs. These are deep, well drained soils that have a loam B2t horizon. The soils formed in lime-influenced alluvial material washed from soils on uplands underlain by sandstone, siltstone, and shale. Kanawha soils are on high flood plains mostly near the Elk, Kanawha, and Coal Rivers. Slopes range from 0 to 8 percent but are dominantly 0 to 3 percent.

The Kanawha soils are on the landscape with well drained Udifluvents, loamy; moderately well drained Cotaco soils; somewhat poorly drained Tyler soils; and somewhat poorly drained to poorly drained Fluvaquents. The Kanawha soils have a more developed profile than the Udifluvents, loamy; are better drained than the Cotaco and Tyler soils and Fluvaquents; and do not have the fragipan typical of the Tyler soils.

Typical pedon of Kanawha fine sandy loam, 0 to 3 percent slopes, in a field approximately 100 feet west of Coal River and 1/4 mile north of Mannens Branch, near the Lincoln County line:

Ap—0 to 9 inches, dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; friable; many roots; medium acid; abrupt smooth boundary.
B1—9 to 16 inches, dark yellowish brown (10YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; common roots; medium acid; clear wavy boundary.
B21t—16 to 28 inches, dark yellowish brown (10YR 4/4) heavy loam; moderate medium subangular blocky structure; friable; common roots; few discontinuous clay films on ped faces; medium acid; gradual wavy boundary.
B22t—28 to 44 inches, dark brown (7.5YR 4/4) loam; weak to moderate medium subangular blocky structure; friable; common roots; few discontinuous clay films on ped faces; medium acid; gradual wavy boundary.
B3—44 to 52 inches, dark yellowish brown (10YR 4/4) light loam; weak fine and medium subangular blocky structure; friable; few roots; medium acid; gradual wavy boundary.
C—52 to 60 inches, dark yellowish brown (10YR 4/4) heavy fine sandy loam; few fine grayish brown (10YR 5/2) mottles; massive; friable; few roots; medium acid.

The solum thickness ranges from 40 to 60 inches. Depth to bedrock is generally more than 6 feet. Coarse fragments make up 0 to 15 percent of the solum and as much as 30 percent of the C horizon. Reaction is medium acid to strongly acid in the A horizon and upper part of the B horizon and slightly acid to medium acid in the lower part of the B horizon and in the C horizon, unless the soil is limed.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 through 4.

The B horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 4 through 6. It is mainly loam, silt loam, light clay loam, or sandy clay loam and has fine sandy loam in some profiles.

The C horizon is fine sandy loam, loam, light sandy clay loam, or their gravelly analogues and is stratified in places.

Laidig series

The Laidig series consists of fine-loamy, mixed, mesic Typic Fragiudults. These are deep, well drained soils that have a loamy B2t horizon underlain by a firm and brittle fragipan. The soils formed in acid colluvial material that moved downslope mainly from areas of Gilpin, Clymer,

and Dekalb soils on uplands. Laidig soils are on foot slopes mostly in the southern half of the county. Slopes range from 3 to 35 percent but are dominantly 25 to 35 percent.

The Laidig soils are on the landscape with well drained Gilpin, Clymer, and Dekalb soils and Udifluvents. Laidig soils have a fragipan that the other soils do not have. They are deeper than the Gilpin or Dekalb soils and have a more developed profile than Udifluvents.

Typical pedon of Laidig channery sandy loam, 25 to 35 percent slopes, in an area of woodland 70 feet north of Davis Creek Road and 375 feet west of the main gate of the Kanawha State Forest:

O1—1 inch to 0, partially decomposed leaves and twigs.

A1—0 to 3 inches, very dark grayish brown (10YR 3/2) channery sandy loam; weak medium granular structure; very friable; many roots; 20 percent sandstone fragments; strongly acid; clear wavy boundary.

A3—3 to 9 inches, dark brown (10YR 4/3) channery sandy loam; weak medium subangular blocky structure; friable; common roots; 20 percent sandstone fragments; strongly acid; clear wavy boundary.

B1—9 to 13 inches, yellowish brown (10YR 5/4) channery light loam; moderate medium subangular blocky structure; friable; common roots; 15 percent sandstone fragments; strongly acid; clear wavy boundary.

B21t—13 to 25 inches, dark yellowish brown (10YR 4/4) channery loam; moderate medium subangular blocky structure; friable; few roots; many very fine pores; few discontinuous clay films on ped faces; 15 percent sandstone fragments; strongly acid; clear wavy boundary.

B22t—25 to 37 inches, brown to dark brown (10YR 4/3) channery loam; few medium brown (10YR 5/3) mottles; weak to moderate medium and coarse subangular blocky structure; firm; common fine pores; few discontinuous clay films on ped faces; few oxide concretions; 15 percent sandstone fragments; strongly acid; clear wavy boundary.

B23t—37 to 45 inches, dark yellowish brown (10YR 4/4) channery loam; few medium brown (10YR 5/3) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; firm; common fine pores, few discontinuous clay films on ped faces; few oxide concretions; 20 percent sandstone fragments; strongly acid; clear wavy boundary.

Bx1—45 to 51 inches, dark yellowish brown (10YR 4/4) channery loam; few medium brown (10YR 5/3) mottles; weak very coarse prismatic structure parting to weak coarse subangular blocky; firm, brittle; common fine pores; few oxide concretions; 20 percent sandstone fragments; strongly acid; clear wavy boundary.

Bx2—51 to 82 inches, mixed light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) channery loam; weak very coarse prismatic structure parting to weak coarse subangular blocky; brittle, firm; common fine pores; common oxide concretions; 35 percent sandstone fragments; strongly acid.

The solum thickness ranges from 60 to 82 inches or more. Depth to bedrock is generally more than 5 feet. Depth to the fragipan ranges from 32 to 50 inches. Coarse fragments make up 15 to 25 percent of the A and B horizons above the fragipan and 15 to 50 percent of the fragipan. The profile is strongly acid to very strongly acid throughout unless limed.

The A1 horizon has value of 3 or 4 and chroma of 2 or 3. The A2 horizon, where present, and the A3 horizon have value of 4 through 6 and chroma of 3 or 4. The A horizon is channery loam and channery sandy loam.

The B horizon has hue of 10YR and 7.5YR, value of 4 or 5, and chroma of 3 through 6. It is mainly channery sandy clay loam, channery loam, or channery heavy sandy loam.

The Bx horizon has hue of 10YR and 7.5YR, value of 4 or 5, and chroma of 2 through 6. It is mainly channery sandy clay loam, channery loam, or channery sandy loam.

Monongahela series

The Monongahela series consists of fine-loamy, mixed, mesic Typic Fragiudults. These are deep, moderately well drained soils that have a heavy silt loam B2t horizon underlain by a firm and brittle fragipan. The soils formed in old acid alluvial material washed from soils on uplands underlain by shale, siltstone, and sandstone. Monongahela soils are on high stream terraces mainly near the Coal and Kanawha Rivers. Slopes range from 3 to 15 percent but are dominantly 8 to 15 percent.

The Monongahela soils are on the landscape with well drained Allegheny soils and well drained to moderately well drained Vincent soils. Monongahela soils are not so well drained as the Allegheny soils and are coarser textured than the Vincent soils. They have a fragipan that the Allegheny and Vincent soils do not have.

Typical pedon of Monongahela silt loam, 3 to 8 percent slopes, in a meadow 300 feet southeast of Falls Creek Road and 1/2 mile southwest of the intersection of Falls Creek and Coal River Road:

Ap—0 to 7 inches, dark brown (10YR 4/3) silt loam; moderate medium granular structure; very friable; many roots; medium acid; abrupt smooth boundary.

B1—7 to 10 inches, yellowish brown (10YR 5/6) silt loam; weak fine subangular blocky structure; very friable; common roots; common dark brown (10YR 4/3) coatings on ped faces; medium acid; clear wavy boundary.

B21t—10 to 20 inches, yellowish brown (10YR 5/6) heavy silt loam; moderate medium subangular blocky structure; friable; common roots; few discontinuous clay films on ped faces; strongly acid; clear wavy boundary.

B22t—20 to 26 inches, yellowish brown (10YR 5/8) heavy silt loam; common light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; common roots; common discontinuous clay films on ped faces; few oxide coatings; strongly acid; clear wavy boundary.

Bx1—26 to 40 inches, yellowish brown (10YR 5/8) heavy silt loam; common medium light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) mottles and coatings; weak medium platy structure; brittle, firm; few roots; common oxide coatings and concretions; very strongly acid; gradual wavy boundary.

Bx2—40 to 50 inches, yellowish brown (10YR 5/6) silt loam; common red (2.5YR 4/6) and light brownish gray (10YR 6/2) mottles; weak very coarse prismatic structure parting to weak thick platy; brittle, very firm; common light brownish gray (10YR 6/2) clay films on ped faces; 10 percent gravel; very strongly acid; gradual wavy boundary.

C—58 to 60 inches, strong brown (7.5YR 5/8) silt loam; common pinkish gray (7.5YR 6/2) and red (2.5YR 4/8) mottles and coatings; massive; very firm; 10 percent gravel; very strongly acid.

The solum thickness ranges from 40 to 60 inches. Depth to bedrock is more than 5 feet. Depth to low chroma mottles ranges fom 16 to 25 inches. Depth to the fragipan ranges from 18 to 30 inches. Rounded coarse fragments make up 0 to 15 percent of the solum and as much as 35 percent of the C horizon. The profile is strongly acid to very strongly acid throughout unless limed.

The Ap horizon has chroma of 2 or 3.

The B1 and Bt horizons have chroma of 4 through 8. They are dominantly silt loam but include loam, light silty clay loam, or clay loam.

The Bx horizon has value of 5 or 6 and chroma of 4 through 8. It is silt loam to sandy clay loam.

The C horizon is sandy loam, silt loam, or clay loam.

Moshannon series

The Moshannon series consists of fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts. These are deep, well drained soils that have a heavy silt loam and light silty clay loam B2 horizon. The soils formed in lime-influenced alluvial material washed from soils on uplands underlain by shale, siltstone, and sandstone. Moshannon soils are on flood plains of streams mostly in the northwestern part of the county. Slopes range from 0 to 3 percent.

The Moshannon soils are on the landscape with well drained Sensabaugh and Hackers soils and moderately well drained Senecaville soils. Moshannon soils are better drained than the Senecaville soils, are finer textured than the Sensabaugh soils, and have a less developed profile and are on lower flood plains than the Hackers soils.

Typical pedon of Moshannon silt loam, in a field 70 feet south of a rock quarry, 70 feet east of Rocky Fork, 0.15 mile north of the confluence of Rocky Fork and Fisher Branch:

Ap—0 to 7 inches, dark reddish brown (5YR 3/4) light silt loam; weak medium and fine granular structure; friable; many roots; neutral; clear smooth boundary.

B21—7 to 18 inches, reddish brown (5YR 4/4) heavy silt loam; moderate medium subangular blocky structure; friable; common roots; few silt coatings on ped faces; medium acid; gradual wavy boundary.

B22—18 to 36 inches, reddish brown (5YR 4/4) light silty clay loam; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; friable; few roots; common silt coatings on ped faces; medium acid; gradual wavy boundary.

B3—36 to 44 inches, dark reddish brown (5YR 3/4) silt loam; weak medium prismatic structure parting to weak medium and coarse subangular blocky; friable; common silt coatings on ped faces; medium acid; clear wavy boundary.

C—44 to 66 inches, reddish brown (5YR 4/4) fine sandy loam; faint coarse dark reddish brown (5YR 3/4) mottles; massive; friable; medium acid.

The solum thickness ranges from 36 to 48 inches. Depth to bedrock is generally more than 5 feet. The profile is slightly acid to medium acid throughout unless limed. Coarse fragments make up less than 5 percent of the solum and as much as 20 percent of the C horizon.

The Ap horizon has hue of 5YR or 7.5YR and value of 3 or 4.

The B horizon has value of 3 or 4 and chroma of 3 or 4. It ranges from silty clay loam to silt loam.

The C horizon is silt loam or loam and is commonly fine sandy loam at a depth of more than 40 inches.

Senecaville series

The Senecaville series consists of fine silty, mixed, mesic Fluvaquentic Eutrochrepts. These are deep, moderately well drained soils that have a silt loam B2 horizon. The soils formed in alluvial material washed from soils on uplands underlain by lime-influenced red shale and acid siltstone and sandstone. Senecaville soils are mostly on flood plains and low stream terraces in the northwestern part of the county. Slopes range from 0 to 3 percent.

The Senecaville soils are on the landscape with well drained Moshannon, Sensabaugh, and Hackers soils and moderately well drained Cotaco soils. Senecaville soils are not so well drained as the Moshannon, Sensabaugh, and Hackers soils. They flood more frequently than the Cotaco and Hackers soils and are finer textured than the Cotaco and Sensabaugh soils.

Typical pedon of Senecaville silt loam, in a pasture, 1,000 feet south of the Tornado Post Office, near the south bank of Falls Creek:

Ap—0 to 6 inches, brown to dark brown (7.5YR 4/2) silt loam; weak fine granular structure; friable; many roots; medium acid, clear wavy boundary.

B21—6 to 22 inches, reddish brown (5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common roots; medium acid; gradual wavy boundary.

B22—22 to 40 inches, reddish brown (5YR 5/4) silt loam; common faint strong brown (7.5YR 5/6) and red (2.5YR 5/8) mottles and few reddish gray (5YR 5/2) mottles; weak fine and medium subangular blocky structure; friable; few roots; common black flecks; medium acid; gradual wavy boundary.

C—40 to 60 inches, reddish brown (5YR 4/4) silt loam; few reddish gray (5YR 5/2) mottles; massive; common black flecks; slightly acid.

The solum thickness ranges from 30 to 40 inches. Depth to bedrock is generally more than 4 feet. Depth to low chroma mottles ranges from 16 to 24 inches. The low chroma mottles are commonly masked by the red colors of the matrix. The profile is slightly acid to strongly acid throughout unless limed.

The Ap horizon has chroma of 2 through 4.

The B horizon has value of 4 or 5 and chroma of 4 through 6. It is silty clay loam or silt loam.

The C horizon is dominantly silt loam but is commonly stratified with fine and medium sand.

Sensabaugh series

The Sensabaugh series consists of fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts. These are deep, well drained soils that have a silt loam and gravelly loam B horizon. The soils formed in lime-influenced alluvial material washed from soils on uplands underlain by shale, siltstone, and sandstone. Sensabaugh soils are on flood plains of streams mostly in the northwestern part of the county. Slopes range from 0 to 3 percent.

The Sensabaugh soils are on the landscape with well drained Moshannon soils and moderately well drained Senecaville soils. Sensabaugh soils are coarser textured than the Moshannon and Senecaville soils and are better drained than the Senecaville soils.

Typical pedon of Sensabaugh silt loam, near old wine cellars, in Dutch Hollow, 0.85 mile north of I-64:

Ap1—0 to 6 inches, dark brown (7.5YR 3/2) silt loam; moderate fine granular structure; very friable; many roots; 2 percent gravel; neutral; clear wavy boundary.

Ap2—6 to 10 inches, dark reddish brown (5YR 3/4) silt loam; weak fine subangular blocky structure parting to moderate fine granular; very friable; many roots; 5 percent gravel; neutral; clear wavy boundary.

B21—10 to 19 inches, reddish brown (5YR 4/3) heavy silt loam; moderate fine subangular blocky structure; friable; common roots; 5 percent gravel; slightly acid; clear wavy boundary.

B22—19 to 25 inches, reddish brown (5YR 4/4) silt loam; moderate fine subangular blocky structure; friable; few roots; 5 percent gravel; slightly acid; clear wavy boundary.

B3—25 to 31 inches, reddish brown (5YR 4/4) gravelly loam; weak medium subangular blocky structure; few roots; 40 percent gravel; slightly acid; clear wavy boundary.

C—31 to 48 inches, reddish brown (5YR 4/3) very gravelly loam and very gravelly sandy loam; massive; 65 percent gravel and channers; slightly acid.

The solum thickness ranges from 24 to 35 inches. Depth to bedrock is generally more than 5 feet. The profile is medium acid or slightly acid throughout unless limed. Coarse fragments make up as much as 20 percent of the A horizon, 5 to 40 percent of the B horizon, and 30 to 70 percent of the C horizon.

The Ap horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 2 through 4.

The B2 horizon has hue of 7.5YR or 5YR and chroma of 3 or 4. It is loam or silt loam or their gravelly analogues.

The B3 and C horizons are very gravelly sandy loam, very gravelly loam, gravelly sandy loam, or gravelly loam.

Tyler series

The Tyler series consists of fine-silty, mixed, mesic Aeric Fragiaquults. These are deep, somewhat poorly drained soils that have a heavy silt loam B2t horizon underlain by a firm and brittle fragipan. The soils formed in old acid alluvial material washed from soils on uplands underlain by shale, siltstone, and sandstone. Tyler soils are on stream terraces mainly near the Coal and Kanawha Rivers. Slopes range from 0 to 3 percent.

The Tyler soils are on the landscape with well drained Kanawha soils, moderately well drained Cotaco soils, and poorly drained to somewhat poorly drained Fluvaquents. Tyler soils are not so well drained as the Kanawha and Cotaco soils. Tyler soils have a fragipan that the Cotaco soils, Kanawha soils, and Fluvaquents do not have.

Typical pedon of Tyler silt loam, in idle field 780 feet southwest of Coal River bridge, near Upper Falls:

Ap—0 to 8 inches, dark brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many roots; strongly acid; abrupt smooth boundary.

B1t—8 to 14 inches, yellowish brown (10YR 5/4) silt loam; common pale brown (10YR 6/2) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; many roots; few discontinuous clay films on ped faces; very strongly acid; clear wavy boundary.

B2t—14 to 20 inches, yellowish brown (10YR 5/4) heavy silt loam; many gray (10YR 6/1), yellowish brown (10YR 5/6), and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; common roots; few discontinuous clay films on ped faces; few oxide coatings; very strongly acid; clear wavy boundary.

Bx1—20 to 37 inches, yellowish brown (10YR 5/4) heavy silt loam; many gray (10YR 6/1), yellowish brown (10YR 5/6), and brown (7.5YR 4/4) mottles; weak very coarse prismatic structure parting to moderate medium subangular blocky; brittle, very firm; few roots; pockets of clay loam; common pale brown (10YR 6/3) clay films; many oxide coatings; very strongly acid; gradual wavy boundary.

Bx2—37 to 46 inches, yellowish brown (10YR 5/4) clay loam; many gray (10YR 6/1), yellowish brown (10YR 5/6), and brown (7.5YR 4/4) mottles; weak very coarse prismatic structure parting to weak medium subangular blocky; brittle, very firm; common pale brown (10YR 6/3) clay films; common oxide coatings; very strongly acid; gradual wavy boundary.

Bx3—46 to 60 inches, yellowish brown (10YR 5/4) clay loam; many gray (10YR 6/1), yellowish brown (10YR 5/6), and brown (7.5YR 4/4) mottles; weak very coarse prismatic structure; very firm, brittle; few pale brown (10YR 6/3) clay films; common oxide coats; few siltstone chips covered with gray (10YR 6/1) material; very strongly acid.

The solum thickness ranges from 40 to 60 inches or more. Depth to bedrock is more than 5 feet. Depth to low chroma mottles ranges from 6 to 16 inches. Depth to the fragipan ranges from 18 to 24 inches. The profile is strongly acid to very strongly acid throughout unless limed.

The Ap horizon has value of 4 or 5 and chroma of 1 through 3.

The part of the B horizon above the fragipan has value of 5 or 6 and chroma of 2 through 6. It is silt loam or silty clay loam. The Bx horizon has crushed value of 5 or 6 and chroma of 4 through 6. It is heavy silt loam, clay loam, or silty clay loam.

The C horizon is clay loam or silty clay loam.

Udifluvents

Udifluvents consist of deep, excessively drained, well drained, and moderately well drained soils. The soils formed in recent alluvium washed from soils on uplands underlain by sandstone, siltstone, and shale. Udifluvents are on long, narrow flood plains of streams mostly in the southern half of the county. Slopes range from 0 to 3 percent.

Udifluvents are on the landscape with well drained Laidig and Kanawha soils and moderately deep, well drained Dekalb soils.

Because of the variability of these soils, a typical pedon is not given. Depth to bedrock is generally more than 4 feet. Coarse fragments make up 0 to 75 percent of some subhorizons. The soils are very strongly acid.

The A horizon dominantly has hue of 10YR, value of 3 through 5, and chroma of 2 through 4. It is loam and sandy loam or their gravelly analogues. The A horizon ranges from 4 to 12 inches in thickness.

The underlying horizons dominantly have hue of 10YR and 7.5YR, value of 5 or 6, and chroma of 3 through 6. They range from loam to loamy sand or their gravelly or very gravelly analogues. Structure ranges from weak, subangular blocky to single grained and massive. Stratification is common.

Udorthents

Udorthents consist of moderately deep to deep, well drained to excessively drained soils. They formed in soil material that has been disturbed by excavating, cutting, or filling operations. Generally the soils have a thin A horizon over a C horizon. Udorthents have highly variable composition. Some areas have been strip mined, and others have been cut and filled during construction of roads, airports and buildings. The areas are throughout the county. Slopes range from 0 to more than 55 percent.

Because of the variability of these soils, a typical pedon is not given. Udorthents have a solum that ranges from 5 to 10 inches in thickness. Bedrock is at a depth of more than 2 feet. Coarse fragments make up 0 to 75 percent of the soil. The soils are extremely acid to medium acid.

The A horizon dominantly has hue of 5YR through 10YR, value of 3 through 6, and chroma of 3 through 8. It ranges from sandy loam to silty clay loam or their channery analogues. The A horizon is 2 to 8 inches thick.

The underlying horizons dominantly have hue of 5YR through 10YR, value of 3 through 7, and chroma of 1

through 8. They range from sandy loam to silty clay or their channery and very channery analogues.

Upshur series

The Upshur series consists of fine, mixed, mesic Typic Hapludalfs. These are moderately deep or deep, well drained soils that have a clay B2t horizon. The soils formed in limy material weathered from red clay shale that contains some carbonates. Upshur soils are on ridges, benches, and hillsides in the northern half of the county. Slopes range from 10 to 55 percent but are dominantly 20 to 55 percent.

Upshur soils are on the landscape with well drained Gilpin soils, and they are near well drained Vandalia soils and moderately well drained Coolville soils. Upshur soils are redder than the Gilpin and Coolville soils. Upshur soils are finer textured than the Gilpin soils and are better drained than the Coolville soils. Upshur soils do not have the sandstone coarse fragments typical of the Vandalia soils, and they are shallower and slightly finer textured.

Typical pedon of Upshur silty clay loam, in an area of Gilpin-Upshur complex, 20 to 30 percent slopes, severely eroded, in a pasture approximately 225 feet north of Second Creek Road, 1.5 miles west of I-77:

Ap—0 to 4 inches, reddish brown (5YR 4/4) silty clay loam; weak fine subangular blocky structure parting to weak fine granular; firm, sticky and plastic; many roots; neutral; clear smooth boundary.

B21t—4 to 9 inches, dark reddish brown (5YR 3/4) clay; weak fine subangular blocky structure; firm, sticky and plastic; few roots; continuous clay films on ped faces; slightly acid; clear wavy boundary.

B22t—9 to 15 inches, dark red (2.5YR 3/6) clay; moderate fine subangular blocky structure; firm; very sticky and very plastic; few roots; continuous clay films on ped faces; slightly acid; clear wavy boundary.

B23t—15 to 28 inches, dark reddish brown (2.5YR 3/4) clay; moderate fine and medium subangular blocky structure; firm, very sticky and very plastic; continuous clay films on ped faces; slightly acid; clear wavy boundary.

C—28 to 36 inches, reddish brown (2.5YR 4/4) and pinkish gray (5YR 7/2) shaly clay; massive; 45 percent soft light olive brown (2.5YR 5/4) shale fragments; mildly alkaline; clear wavy boundary.

Cr—36 to 67 inches, weak red (10R 4/3), yellowish red (5YR 4/6), and light olive brown (2.5Y 5/4) calcareous shale.

The solum thickness ranges from 26 to 35 inches. Depth to bedrock ranges from 34 to 50 inches. Coarse fragments make up as much as 25 percent of the lower part of the B horizon and 20 to 75 percent of the C horizon. Many of the coarse fragments are soft shale. In unlimed areas reaction is strongly acid or slightly acid in the upper part of the B horizon, medium acid to neutral in the lower part of the B horizon, and medium acid to moderately alkaline in the C horizon.

The Ap horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 2 through 4. It is silt loam or silty clay loam.

The B horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 3 or 4. It is silty clay or clay or their shaly analogues.

The C horizon is shaly or very shaly analogues of silty clay loam, silty clay, or clay.

The Upshur soils in this county are generally shallower to bedrock than the defined range for the series, but this does not alter use or management.

Vandalia series

The Vandalia series consists of fine, mixed, mesic Typic Hapludalfs. These are deep, well drained soils that have a silty clay B2t horizon. The soils formed in lime-influenced colluvial material that moved downslope mainly from Gilpin and Upshur soils on uplands. They are on foot slopes adjacent to drainageways, on colluvial fans, and around the heads of streams. Vandalia soils are mainly in the northern half of the county. Slopes range from 3 to 35 percent but are dominantly 15 to 25 percent.

Vandalia soils are on the landscape with Gilpin and Upshur soils. Vandalia soils are deeper, have a finer textured profile, and are generally less acid and redder than the Gilpin soils. Vandalia soils have sandstone coarse fragments that the Upshur soils do not have, and they have a slightly coarser textured profile and are deeper.

Typical pedon of Vandalia silty clay loam, 15 to 25 percent slopes, severely eroded, in a pasture 75 feet north of Allen Fork Road, about 0.75 mile west of U.S. 21:

Ap—0 to 4 inches, dark reddish brown (5YR 3/4) silty clay loam; moderate medium subangular blocky structure; friable; many roots; 5 percent coarse fragments; neutral; clear wavy boundary.

B21t—4 to 11 inches, reddish brown (5YR 4/4) silty clay; moderate medium and coarse subangular blocky structure; friable; sticky and plastic; few roots; continuous clay films on ped faces; few black concretions; 5 percent coarse fragments; medium acid; clear wavy boundary.

B22t—11 to 20 inches, reddish brown (5YR 4/4) silty clay; moderate coarse subangular blocky structure; friable; sticky and plastic; few roots; continuous clay films on ped faces; few black concretions; 5 percent coarse fragments; medium acid; clear wavy boundary.

B23t—20 to 41 inches, reddish brown (5YR 4/4) shaly silty clay; moderate coarse subangular blocky structure; friable; sticky and plastic; continuous clay films; 25 percent coarse fragments; common black concretions; medium acid; gradual wavy boundary.

C—41 to 72 inches, dark reddish brown (5YR 3/4) shaly silty clay loam; massive; common black concretions; 40 percent coarse fragments; slightly acid.

The solum thickness ranges from 40 to 80 inches. Depth to bedrock is generally more than 6 feet. Coarse fragments make up 5 to 35 percent of the solum and as much as 50 percent of the C horizon. Unlimed soils are strongly acid to medium acid in the A horizon and upper part of the B horizon and medium acid to slightly acid in the lower part of the B horizon and in the C horizon.

The Ap horizon has hue of 7.5YR and 5YR, value of 3 through 5, and chroma of 2 through 4. It is silt loam or silty clay loam.

The B1 horizon, where present, has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 through 6. It is silty clay loam, channery silty clay loam, or shaly silty clay loam.

The B2t horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 4 through 6. It is silty clay loam, silty clay, light clay, or their shaly or channery analogues.

The C horizon has hue of 5YR or 2.5YR, value of 3 through 5, and chroma of 4 through 6. It is silty clay loam, silty clay, and light clay or their shaly, very shaly, channery, or very channery analogues.

Vincent series

The Vincent series consist of fine, mixed, mesic Typic Hapludalfs. These are deep, well drained or moderately well drained soils that have a heavy silty clay loam and silty clay B2t horizon. The soils formed in old lime-in-

fluenced alluvial material deposited by slackwater and washed from soils on uplands underlain by shale, siltstone, and sandstone. Vincent soils are on terraces mostly in the areas of Cross Lanes, South Charleston, and Sissonville. Slopes range from 3 to 15 percent but are dominantly 8 to 15 percent.

The Vincent soils are on the landscape with well drained Allegheny soils and moderately well drained Monongahela soils. Vincent soils have a finer textured subsoil than the Allegheny or Monongahela soils and do not have the fragipan typical of the Monongahela soils.

Typical pedon of Vincent silt loam, 3 to 8 percent slopes, on the south side of Big Tyler Road, 1/2 mile northeast of the main intersection of Cross Lanes:

Ap—0 to 8 inches, brown to dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many roots; strongly acid; clear wavy boundary.

B21t—8 to 13 inches, strong brown (7.5YR 5/6) heavy silty clay loam; moderate medium subangular blocky structure; friable to firm; slightly sticky and plastic; many roots; continuous clay films on ped faces; strongly acid; clear wavy boundary.

B22t—13 to 25 inches, yellowish red (5YR 5/6) silty clay; strong fine and medium angular blocky structure; firm; sticky and plastic; common roots; continuous clay films on ped faces; strongly acid; clear wavy boundary.

B23t—25 to 35 inches, reddish brown (5YR 4/4) silty clay; strong medium subangular blocky structure parting to strong fine angular blocky; firm; sticky and plastic; few roots; light reddish brown (5YR 6/3) continuous clay films on ped faces; strongly acid; clear wavy boundary.

B3t—35 to 49 inches, reddish brown (5YR 4/4) silty clay; moderate medium prismatic structure parting to strong medium angular blocky; firm; sticky and plastic; few roots; many light gray (5Y 7/2) and few light gray (5GY 7/1) continuous clay films; strongly acid; abrupt smooth boundary.

C—49 to 64 inches, strong brown (7.5YR 5/6) and reddish brown (5YR 4/4) varved silts and clays; medium acid.

The solum thickness ranges from 40 to 60 inches. Depth to bedrock is generally more than 5 feet. Depth to low chroma mottles ranges from 18 to 36 inches. In unlimed areas reaction is strongly acid to medium acid above the C horizon and medium acid to neutral in the C horizon.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 through 4. It is silt loam or silty clay loam.

The B horizon has hue mainly of 5YR and 2.5YR but includes hue of 7.5YR in the upper part. It has value of 4 or 5 and chroma of 4 through 6. It is heavy silty clay loam, silty clay, or clay.

The C horizon is silty clay, silty clay loam, or varved silts and clays.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (7).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 17, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udult (*Ud*, meaning humid, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Hapludults (*Hapl*, meaning simple horizons, plus *udult*, the suborder of Ultisol that have a udic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Hapludults.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is fine-loamy, mixed, mesic Typic Hapludults.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Formation and morphology of the soils

In this section the major factors of soil formation and their effects on the development of the soils of Kanawha County are discussed. The morphology of soils and the process of soil development are explained.

Factors of soil formation

Soils form through the interaction of the five major factors: climate, living organisms, parent material, topography, and time. The relative influence of each factor generally varies from place to place. Local variations in soils are the result of differences in kind of parent materials, topography, and drainage. In some areas one or two factors may dominate the formation of a soil and determine most of its properties.

Climate

Climate affects the formation of soils through its influence on the rate of weathering of rocks and decomposition of minerals and organic matter. It also affects biological activity in the soils and the leaching and movement of weathered material.

Climate does not vary enough in the survey area to account for all the differences among the soils. The climate tends to develop strongly weathered, leached, acid soils that are low to moderate in fertility. This leaching has prevented any appreciable accumulation of bases in all except those soils that developed in bedrock inherently high in bases. For more detailed information, see the section "Climate" in "General nature of the county."

Living organisms

All living organisms, including vegetation, animals, bacteria, and fungi, affect soil formation. Vegetation is generally responsible for the amount of organic matter and the color of the surface layer, and it influences the amount of nutrients in soils. The soils in the county formed under hardwoood trees and have a thin surface layer of organic accumulation. Earthworms, cicada, burrowers, and other animals help to keep the soils open and porous. Bacteria and fungi, through decomposition of vegetation, cause many beneficial changes in the soil, such as release and leaching of elements, aggregation, aeration, and higher moisture content.

Parent material

Parent material, the unconsolidated mass from which soil forms, has much to do with the chemical and mineral composition of the soils. The soils of Kanawha County formed in residuum, alluvium, and colluvium.

The sedimentary rock and unconsolidated sediment from which the soils on uplands formed were laid down in horizontal or nearly horizontal layers, unless they have undergone deformation through movement of the local parts of the earth's crust subsequent to the date of their origin. The geological formations in the county are of the carboniferous period (*3*, *4*, *5*). The Dunkard, the youngest formation, is in the northern tip of the county, where Putnam and Jackson Counties join. Going from north to south and from youngest to oldest, the other formations in the county are the Monongahela, Conemaugh, Allegheny, and Pottsville formations. The Pottsville formation, a part of the Kanawha group, is the dominant formation in the southern portion of the county.

In the part of the county north of Elk River, the Gilpin and Upshur soils are dominant on the uplands. These soils formed in place in acid and lime-influenced shale, siltstone, and sandstone. They are dominantly moderately steep to very steep.

In the southern part of the county and along the side slopes in the vicinity of Charleston, the Clymer and Dekalb soils are dominant. These soils formed in place in acid material weathered from gray sandstone interbedded with siltstone and shale. In the central part of the county, acid gray sandstone and siltstone are in the valley floor and along the side slopes. Limy red shale is dominantly on ridgetops.

Colluvial material is on foot slopes and has moved downslope from soils on uplands. It receives underground and surface water from higher slopes. Vandalia soils, which are in the northern part of the county, formed in lime-influenced material which moved downslope mainly from soils of the Gilpin-Upshur complex on uplands. The Vandalia soils are strongly sloping to steep and are fine textured to moderately fine textured. Laidig soils in the south formed in acid colluvial material which moved downslope mainly from Gilpin, Clymer, and Dekalb soils on uplands. Laidig soils are dominantly strongly sloping to steep and are medium textured to moderately fine textured.

The older acid alluvial material washed from soils on uplands underlain by shale, siltstone, and sandstone is of minor extent. This material is commonly medium textured to moderately fine textured, and it is on terraces along the larger streams of the county. The Allegheny, Monongahela, and Tyler soils formed in this material.

Recent lime-influenced alluvium washed from soils on uplands underlain by shale, siltstone, and sandstone is on flood plains of rivers, streams, and intermittent drainageways in the northern part of the county. This material is medium textured to moderately fine textured. Hackers, Moshannon, Senecaville, and Sensabaugh soils formed in this material.

In the southern part of the county, the recent alluvium has washed from upland soils underlain by acid sandstone, siltstone, and shale and is on flood plains of rivers, streams, and intermittent drainageways. This material is medium textured to moderately coarse textured. The Udifluvents, loamy, and Udifluvents, gravelly, formed in this material. The recently deposited alluvial material along the Kanawha and Coal Rivers has been influenced by lime to some degree. This material is medium textured to moderately fine textured. Kanawha soils and Fluvaquents formed in this material.

Topography

The shape of the land, the lay of the land, the slope, and the depth of the soils to the water table have influenced the formation of soils in the county. Soils formed in steep and very steep areas, where runoff is excessive and movement of soil material by creep is appreciable, have a weakly developed profile. Most soils on uplands show no characteristics associated with wetness. This generally can be attributed to moderate permeability and adequate drainage through the shale or sandstone bedrock.

Some soils show characteristics associated with wetness because of the seasonal high water table. Some gently sloping or nearly level soils on stream terraces and flood plains, where the water table is near the surface for long periods, show a marked evidence of wetness. These soils have a strongly mottled or grayish subsoil. Thus, the length, steepness, and configuration of the slope influence the characteristics of the kind of soil that is formed from place to place. Local differences in soils are largely the result of differences in parent material and topography.

Time

The formation of soils requires time, usually a long period, for changes to take place in the parent material. Soils that formed in alluvial material on flood plains can receive new sediment with each flood. These soils have weak soil structure and slight color differences between layers. In steep areas, soil material may be removed by creep, washing, or mixing by solifluction before the soil has time to form a distinct profile. Dekalb soils are common in such areas.

In the less sloping upland areas, the parent material is relatively stable and its removal is slow. Therefore, the soil forming factors have a long time to act on these materials. As a result, soils that have a distinct genetic horizon, such as Clymer soils, have formed.

Morphology of the soils

This section briefly describes horizon nomenclature and the processes involved in horizon differentiation.

Major soil horizons

The results of the soil-forming factors can be distinguished by the different layers, or soil horizons, seen in a soil profile. The soil profile extends from the surface of the land downward to materials that are little altered by the soil-forming processes.

Most soils contain three major horizons, called A, B, and C horizons. These major horizons can be further subdivided by the use of subscripts and letters to indicate changes within one horizon. An example would be the B2t horizon, which represents a layer within the B horizon that has translocated clay illuviated from the A horizon.

The A horizon is the surface layer. It is the layer that has the largest accumulation of organic matter. The dark upper part is called an A1 horizon. The A horizon is also the layer of maximum leaching, or eluviation of clay and soluble minerals. When considerable leaching has taken place, an A2 horizon is formed, normally in the lower part of the A horizon. In cultivated areas, the A horizon has been mixed by plowing and is designated as an Ap horizon.

The B horizon lies underneath the A horizon and is commonly called the subsoil layer. The B horizon is the horizon of maximum accumulation, or illuviation of clay, iron, aluminum, or other compounds leached from the A horizon. In some soils the B horizon is formed by alteration in place rather than from illuviation. The alteration may be due to oxidation and reduction of iron or the weathering of clay minerals. The B horizon is generally firmer, has blocky or prismatic structure, and is generally lighter colored than the A1 horizon but darker colored than the C horizon.

The C horizon is below the A or B horizon. It consists of materials that are little altered by the soil-forming processes but may be modified by weathering.

Processes of soil horizon differentiation

Several processes are involved in the formation of horizons in the soils of the county. These include the accumulation of organic matter, the leaching of soluble salts, the formation and translocation of clay minerals, and the reduction and transfer of iron. These processes are continually taking place, generally at the same time throughout the profile.

The accumulation of organic matter takes place with the decomposition of plant residue. The surface layer of tilled soils in the county averages about 1.5 to 3 percent organic-matter content. A thin A1 horizon in wooded areas commonly has 4.5 to 8 percent organic matter.

In order for soils to have distinct soil horizons, some of the calcium and other soluble salts are leached before the translocation of clay minerals. Many factors affect this leaching, including major vegetation, the kinds of salts originally present, the depth to which the soil solution percolates, and the texture of the soil profile. Once soil structure develops, it also affects leaching.

The most important process of soil horizon formation in the county is the formation and translocation of silicate clay minerals. The amount of clay minerals in a soil profile is inherent to the parent material, but amounts of clay vary from one soil horizon to another. Clay minerals are generally eluviated from the A horizon and illuviated into the B horizon as clay accumulates on ped faces and in pores and root channels. In some soils an A2 horizon has been formed by considerable eluviation of clay minerals to the B horizon. The A2 horizon is light colored and in places has weak, platy structure. The Gilpin soils are an example of clay mineral translocation.

The reduction and transfer of iron is associated mainly with the wetter, more poorly drained soils. This process is called gleying. Moderately well drained soils have yel-

lowish brown, strong brown, reddish brown, or yellowish red mottles, indicating segregation of iron. Somewhat poorly drained soils, such as Tyler soils, have a grayish subsoil and grayish underlying material, indicating reduction and transfer of iron.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	More than 5.2

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Complex, soil. A mapping unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Compressible. Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Excess salts. Excess water soluble salts. Excessive salts restrict the growth of most plants.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

***Fine textured* (heavy textured) soil.** Sandy clay, silty clay, and clay.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are

separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The accumulation of material in a soil horizon through the deposition of suspended material and organic matter removed from horizons above. Part of the fine clay in the B horizon, or subsoil, of many soils is from the A horizon, or surface layer; such B horizons are called illuvial horizons.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. Inadequate strength for supporting loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water forms subsurface tunnels or pipelike cavities in the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slip hazard. The downhill movement of a mass of generally wet or saturated soil and loose rock.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.005 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solifluction. The process by which masses of saturated waste flow from higher to lower ground.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use or management.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt*, *silt loam*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within 1 year; specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Illustrations

Figure 1.—A housing development mainly on Vandalia silt loam, 15 to 25 percent slopes. This area was used for farmland.

Figure 2.—An area in the Urban land-Kanawha map unit.

Figure 3.—A wet area of Cotaco loam.

Figure 4.—An area of pasture on Senacaville silt loam.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	43.3	24.8	34.1	72	-4	78	3.33	2.01	4.50	8	8.0
February	46.1	26.6	36.4	72	2	79	3.33	2.04	4.48	8	8.6
March	55.1	34.0	44.6	84	15	220	3.98	2.50	5.32	9	4.6
April	67.3	43.7	55.6	88	24	468	3.56	2.36	4.64	8	.4
May	76.0	51.6	63.8	92	31	738	3.71	2.10	5.01	8	.0
June	82.8	59.5	71.2	95	42	936	3.19	2.04	4.21	7	.0
July	85.4	63.7	74.6	97	48	1,073	5.11	3.17	6.85	8	.0
August	84.2	62.8	73.5	95	47	1,039	3.63	1.77	5.15	6	.0
September	79.1	56.1	67.6	95	36	828	2.96	1.75	4.04	6	.0
October	68.4	44.5	56.5	87	24	512	2.41	.96	3.57	5	.2
November	55.4	35.1	45.3	80	12	174	2.93	1.67	3.95	7	2.2
December	46.0	28.4	37.2	75	3	123	3.23	1.76	4.41	7	5.7
Year	65.8	44.2	55.0	98	-4	6,268	41.37	35.41	47.07	87	29.7

[1]Recorded in the period 1951-74 at Charleston, W. Va.

[2]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature[1]		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 3	April 24	May 9
2 years in 10 later than--	March 30	April 19	May 3
5 years in 10 later than--	March 22	April 8	April 23
First freezing temperature in fall:			
1 year in 10 earlier than--	October 24	October 16	October 5
2 years in 10 earlier than--	October 29	October 20	October 10
5 years in 10 earlier than--	November 8	October 29	October 19

[1]Recorded in the period 1951-74 at Charleston, W. Va.

TABLE 3.--GROWING SEASON LENGTH

Probability	Daily minimum temperature during growing season[1]		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	209	181	158
8 years in 10	217	189	165
5 years in 10	230	203	178
2 years in 10	244	217	192
1 year in 10	251	224	199

[1]Recorded in the period 1951-74 at Charleston, W. Va.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AgB	Allegheny loam, shale substratum, 3 to 8 percent slopes	209	(1)
AgC	Allegheny loam, shale substratum, 8 to 15 percent slopes	1,004	0.2
CaC	Clymer loam, 10 to 20 percent slopes	767	0.1
CDD	Clymer-Dekalb complex, moderately steep	8,202	1.4
CDE	Clymer-Dekalb complex, steep	24,503	4.2
CDF	Clymer-Dekalb complex, very steep	237,601	41.0
CoB	Coolville silt loam, 3 to 10 percent slopes	447	0.1
CoC	Coolville silt loam, 10 to 20 percent slopes	810	0.1
CrC3	Coolville silty clay loam, 10 to 20 percent slopes, severely eroded	323	0.1
Ct	Cotaco loam	1,338	0.2
Dm	Dumps	1,164	0.2
FL	Fluvaquents	174	(1)
GlC	Gilpin silt loam, 10 to 20 percent slopes	2,284	0.4
GlD	Gilpin silt loam, 20 to 30 percent slopes	17,103	2.9
GlE	Gilpin silt loam, 30 to 40 percent slopes	25,160	4.3
GpC	Gilpin-Upshur silt loams, 10 to 20 percent slopes	2,163	0.4
GpD	Gilpin-Upshur silt loams, 20 to 30 percent slopes	16,338	2.8
GRE	Gilpin-Upshur silt loams, steep	20,452	3.5
GRF	Gilpin-Upshur silt loams, very steep	63,408	11.0
GsC3	Gilpin-Upshur complex, 10 to 20 percent slopes, severely eroded	3,810	0.7
GsD3	Gilpin-Upshur complex, 20 to 30 percent slopes, severely eroded	37,473	6.4
GUE3	Gilpin-Upshur complex, steep, severely eroded	34,001	5.9
HaA	Hackers silt loam, 0 to 3 percent slopes	781	0.1
HaB	Hackers silt loam, 3 to 8 percent slopes	443	0.1
KaA	Kanawha fine sandy loam, 0 to 3 percent slopes	1,524	0.3
KaB	Kanawha fine sandy loam, 3 to 8 percent slopes	460	0.1
LaD	Laidig channery sandy loam, 15 to 25 percent slopes	3,560	0.6
LaE	Laidig channery sandy loam, 25 to 35 percent slopes	3,659	0.6
LdB	Laidig channery loam, 3 to 8 percent slopes	320	0.1
LdC	Laidig channery loam, 8 to 15 percent slopes	1,983	0.3
MgB	Monongahela silt loam, 3 to 8 percent slopes	839	0.1
MgC	Monongahela silt loam, 8 to 15 percent slopes	874	0.2
Mo	Moshannon silt loam	2,095	0.4
Qu	Quarries	145	(1)
Se	Senecaville silt loam	952	0.2
Sn	Sensabaugh silt loam	3,671	0.6
Ty	Tyler silt loam	283	(1)
UA	Udifluvents, gravelly	6,769	1.2
UB	Udifluvents, loamy	3,381	0.6
UC	Udorthents, smoothed-Urban land complex	5,738	1.0
UD	Udorthents, strip mine	18,845	3.2
Ue	Urban land	3,902	0.7
Uf	Urban land-Fluvaquents complex	712	0.1
Uk	Urban land-Kanawha complex	3,407	0.6
Ut	Urban land-Tyler complex	1,743	0.3
VaB	Vandalia silt loam, 3 to 8 percent slopes	766	0.1
VaC	Vandalia silt loam, 8 to 15 percent slopes	1,156	0.2
VaD	Vandalia silt loam, 15 to 25 percent slopes	1,299	0.2
VaE	Vandalia silt loam, 25 to 35 percent slopes	664	0.1
VdC3	Vandalia silty clay loam, 8 to 15 percent slopes, severely eroded	378	0.1
VdD3	Vandalia silty clay loam, 15 to 25 percent slopes, severely eroded	5,376	0.9
VdE3	Vandalia silty clay loam, 25 to 35 percent slopes, severely eroded	1,920	0.3
VeB	Vincent silt loam, 3 to 8 percent slopes	157	(1)
VeC	Vincent silt loam, 8 to 15 percent slopes	455	0.1
VnC3	Vincent silty clay loam, 8 to 15 percent slopes, severely eroded	375	0.1
	Water	3,734	0.6
	Total	581,100	100.0

[1]Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[All yields were estimated for a high level of management in 1976. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Corn	Oats	Wheat	Grass-legume hay	Alfalfa hay	Kentucky bluegrass pasture
	Bu	Bu	Bu	Ton	Ton	AUM[1]
AgB---- Allegheny	115	70	45	3.5	4.5	5.5
AgC---- Allegheny	105	70	40	3.5	4.5	4.5
CaC---- Clymer	110	70	40	3.0	4.0	4.5
CDD---- Clymer	85	55	35	2.5	3.5	4.0
CDE---- Clymer	---	---	---	---	---	3.5
CDF---- Clymer	---	---	---	---	---	---
CoB---- Coolville	90	65	40	3.0	3.5	4.5
CoC---- Coolville	75	60	35	3.0	3.5	4.5
CrC3---- Coolville	70	55	30	2.5	3.0	4.0
Ct---- Cotaco	110	65	40	3.0	3.5	4.5
[2]Dm. Dumps						
[2]FL. Fluvaquents						
GlC---- Gilpin	85	60	35	3.0	3.5	4.5
GlD---- Gilpin	80	55	30	2.5	3.0	4.0
GlE---- Gilpin	---	---	---	---	---	3.0
GpC---- Gilpin	80	60	35	3.0	4.0	4.5
GpD---- Gilpin	75	55	30	2.5	3.5	4.0
GRE---- Gilpin	---	---	---	---	---	3.5
GRF---- Gilpin	---	---	---	---	---	---
GsC3---- Gilpin	75	55	30	2.5	3.5	4.0
GsD3---- Gilpin	---	---	---	---	---	3.5

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Wheat	Grass-legume hay	Alfalfa hay	Kentucky bluegrass pasture
	Bu	Bu	Bu	Ton	Ton	AUM[1]
GUE3---------- Gilpin	---	---	---	---	---	---
HaA---------- Hackers	135	80	50	3.5	5.0	5.5
HaB---------- Hackers	130	80	50	3.5	5.0	5.5
KaA---------- Kanawha	135	80	50	3.5	5.0	5.5
KaB---------- Kanawha	130	80	50	3.5	5.0	5.5
LaD---------- Laidig	85	60	30	2.5	3.5	4.0
LaE---------- Laidig	---	---	---	---	---	3.5
LdB---------- Laidig	100	70	40	3.0	4.0	4.5
LdC---------- Laidig	95	65	35	3.0	4.0	4.5
MgB---------- Monongahela	110	65	40	3.0	3.5	4.5
MgC---------- Monongahela	90	60	35	3.0	3.0	4.5
Mo---------- Moshannon	125	75	45	3.5	5.0	5.5
[2]Qu. Quarries						
Se---------- Senecaville	120	75	45	3.5	4.5	5.0
Sn---------- Sensabaugh	125	75	45	3.5	4.5	5.5
Ty---------- Tyler	95	60	---	3.0	---	4.5
[2]UA, [2]UB. Udifluvents						
UC, [2]UD. Udorthents						
[2]Ue, Uf. Urban land						
Uk---------- Urban land	---	---	---	---	---	---
Ut---------- Urban land	---	---	---	---	---	---
VaB---------- Vandalia	105	65	40	3.0	4.5	4.5
VaC---------- Vandalia	100	60	35	3.0	4.5	4.5

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Wheat	Grass-legume hay	Alfalfa hay	Kentucky bluegrass pasture
	Bu	Bu	Bu	Ton	Ton	AUM[1]
VaD---------- Vandalia	90	55	30	2.5	4.0	4.0
VaE---------- Vandalia	---	---	---	---	---	3.5
VdC3---------- Vandalia	90	55	30	2.5	4.0	4.0
VdD3---------- Vandalia	---	---	---	---	---	3.5
VdE3---------- Vandalia	---	---	---	---	---	---
VeB---------- Vincent	100	65	40	3.0	4.0	4.5
VeC---------- Vincent	95	60	35	3.0	4.0	4.5
VnC3---------- Vincent	85	55	30	2.5	3.5	4.0

[1]Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.
[2]See the map unit description for the composition and behavior of the entire unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas excluded. Absence of an entry means no acreage]

Class	Total acreage	Major management concerns (Subclass)	
		Erosion (e)	Wetness (w)
		Acres	Acres
I	2,305	---	---
II	11,697	3,641	8,056
III	11,779	11,496	283
IV	51,388	51,388	---
V	---	---	---
VI	117,287	117,287	---
VII	336,930	336,930	---
VIII	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed in this table. Absence of an entry in a column means the information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	[1]Site index	
AgB, AgC---------- Allegheny	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine, black walnut.
						Yellow-poplar-------	90	
						White oak----------	80	
						Eastern white pine--	90	
CaC---------- Clymer	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine, yellow-poplar.
						Yellow-poplar-------	90	
						Eastern white pine--	90	
						White oak----------	80	
[2]CDD: Clymer---------- (north aspect)	2r	Slight	Moderate	Slight	Slight	Northern red oak----	80	Eastern white pine, yellow-poplar.
						Yellow-poplar-------	90	
						Eastern white pine--	90	
						Black cherry--------		
						Black walnut--------		
Dekalb---------- (north aspect)	2f	Slight	Moderate	Slight	Slight	Northern red oak----	80	Norway spruce, yellow-poplar, eastern white pine.
						Yellow-poplar-------	90	
						White oak----------	80	
						Black oak----------	80	
						Black walnut--------		
[2]CDD: Clymer---------- (south aspect)	3r	Slight	Moderate	Slight	Slight	Northern red oak----	70	Eastern white pine, Virginia pine.
						White oak----------	70	
Dekalb---------- (south aspect)	3f	Slight	Moderate	Moderate	Slight	Northern red oak----	70	Eastern white pine, Virginia pine.
						Yellow-poplar-------	80	
						White oak----------	70	
[2]CDE: Clymer---------- (north aspect)	2r	Slight	Moderate	Slight	Slight	Northern red oak----	80	Eastern white pine, yellow-poplar.
						Yellow-poplar-------	90	
						White oak----------	80	
						White ash----------		
						Black walnut--------		
Dekalb---------- (north aspect)	2f	Slight	Moderate	Slight	Slight	Northern red oak----	80	Norway spruce, black cherry, eastern white pine.
						Yellow-poplar-------	90	
						White oak----------	80	
						White ash----------		
						Black walnut--------		
[2]CDE: Clymer---------- (south aspect)	3r	Slight	Moderate	Slight	Slight	Northern red oak----	70	Eastern white pine, Virginia pine.
						White oak----------	70	
Dekalb---------- (south aspect)	3f	Slight	Moderate	Moderate	Slight	Northern red oak----	70	Eastern white pine, Virginia pine.
						Yellow-poplar-------	80	
						White oak----------	70	
						Black oak----------	70	
[2]CDF: Clymer---------- (north aspect)	2r	Moderate	Severe	Slight	Slight	Northern red oak----	80	Eastern white pine, yellow-poplar.
						Yellow-poplar-------	90	
						White ash----------		
						White oak----------		
Dekalb---------- (north aspect)	2f	Moderate	Severe	Slight	Slight	Northern red oak----	80	Norway spruce, yellow-poplar, eastern white pine.
						Yellow-poplar-------	90	
						White oak----------	80	
						White ash----------		

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	[1]Site index	
[2]CDF:								
Clymer (south aspect)	3r	Moderate	Severe	Slight	Slight	Northern red oak Yellow-poplar White oak	70 80 80	Eastern white pine, Virginia pine.
Dekalb (south aspect)	3f	Moderate	Severe	Moderate	Slight	Northern red oak Yellow-poplar White oak	70 80 70	Eastern white pine, Virginia pine.
CoB, CoC, CrC3 Coolville	3o	Slight	Slight	Slight	Slight	Northern red oak Black oak White oak	70 70 70	Eastern white pine, yellow-poplar.
Ct Cotaco	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Black oak Black walnut	80 90 70	Eastern white pine, yellow-poplar.
GlC Gilpin	3o	Slight	Slight	Moderate	Slight	Northern red oak Yellow-poplar White oak White ash	70 80 70	Japanese larch, Virginia pine, eastern white pine, yellow-poplar.
GlD (north aspect) Gilpin	2r	Moderate	Moderate	Moderate	Slight	Northern red oak Yellow-poplar White oak Black walnut White ash	80 90 80	Japanese larch, eastern white pine, yellow-poplar.
GlD (south aspect) Gilpin	3r	Moderate	Moderate	Moderate	Slight	Northern red oak Yellow-poplar White oak Black oak	70 90 70 70	Japanese larch, Virginia pine, eastern white pine, yellow-poplar.
GlE (north aspect) Gilpin	2r	Moderate	Moderate	Moderate	Slight	Northern red oak Yellow-poplar White oak Black walnut	80 90 80	Japanese larch, eastern white pine, yellow-poplar.
GlE (south aspect) Gilpin	3r	Moderate	Moderate	Moderate	Slight	Northern red oak Yellow-poplar White oak Black oak Black walnut	70 90 70 70	Japanese larch, Virginia pine, eastern white pine, yellow-poplar.
[2]GpC: Gilpin.								
Upshur	3c	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine	70 80 80 70	Eastern white pine, Virginia pine, yellow-poplar.
[2]GpD: Gilpin (north aspect)	2r	Moderate	Moderate	Moderate	Slight	Northern red oak Yellow-poplar White oak Black walnut White ash	80 90 80	Japanese larch, eastern white pine, yellow-poplar.
Upshur (north aspect)	3c	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar Virginia pine Black locust Black walnut	70 80 70	Eastern white pine, Virginia pine, yellow-poplar.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	[1]Site index	
[2]GpD:								
Gilpin (south aspect)	3r	Moderate	Moderate	Moderate	Slight	Northern red oak Yellow-poplar	70 80	Japanese larch, Virginia pine, eastern white pine, yellow-poplar.
Upshur (south aspect)	4c	Severe	Severe	Slight	Slight	Northern red oak Eastern white pine Virginia pine White oak Black oak	60 70 60 60 60	Virginia pine, eastern white pine.
[2]GRE:								
Gilpin (north aspect)	2r	Moderate	Moderate	Moderate	Slight	Northern red oak Yellow-poplar	80 90	Japanese larch, eastern white pine, black cherry, yellow-poplar.
Upshur (north aspect)	3c	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine	70 80 80 70	Eastern white pine, Virginia pine, yellow-poplar.
[2]GRE:								
Gilpin (south aspect)	3r	Moderate	Moderate	Moderate	Slight	Northern red oak Yellow-poplar	70 80	Japanese larch, Virginia pine, eastern white pine, yellow-poplar.
Upshur (south aspect)	4c	Severe	Severe	Slight	Slight	Northern red oak Eastern white pine Virginia pine White oak Black oak	60 70 60 60 60	Virginia pine, eastern white pine.
[2]GRF:								
Gilpin (north aspect)	2r	Severe	Severe	Moderate	Slight	Northern red oak Yellow-poplar	80 90	Japanese larch, eastern white pine.
Upshur (north aspect)	3c	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar Virginia pine White oak	70 80 70 70	Eastern white pine, Virginia pine, yellow-poplar.
[2]GRF:								
Gilpin (south aspect)	3r	Severe	Severe	Moderate	Slight	Northern red oak Yellow-poplar White oak Black oak	70 90 70 70	Japanese larch, Virginia pine, eastern white pine.
Upshur (south aspect)	4c	Severe	Severe	Slight	Slight	Northern red oak Eastern white pine Virginia pine White oak Black oak	60 70 60 60 60	Virginia pine, eastern white pine, shortleaf pine.
[2]GsC3:								
Gilpin.								
Upshur	3c	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine	70 80 80 70	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	[1]Site index	
[2]GsD3:								
Gilpin (north aspect)	2r	Moderate	Moderate	Moderate	Slight	Northern red oak Yellow-poplar White oak White ash	80 90 80	European larch, eastern white pine, black cherry, yellow-poplar.
Upshur (north aspect)	3c	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar Virginia pine White oak Black oak	70 80 70 70 70	Eastern white pine, Virginia pine, yellow-poplar.
[2]GsD3:								
Gilpin (south aspect)	3r	Moderate	Moderate	Moderate	Slight	Northern red oak Yellow-poplar White oak Black oak	70 80 70 70	Japanese larch, Virginia pine, eastern white pine.
Upshur (south aspect)	4c	Severe	Severe	Slight	Slight	Northern red oak Eastern white pine Virginia pine Black oak	60 70 60 60	Virginia pine, eastern white pine.
[2]GUE3:								
Gilpin (north aspect)	2r	Moderate	Moderate	Moderate	Slight	Northern red oak Yellow-poplar Black oak White oak Black locust	80 90 80 80	Japanese larch, eastern white pine.
Upshur (north aspect)	3c	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar Virginia pine Black oak	70 80 70 70	Eastern white pine, Virginia pine.
[2]GUE3:								
Gilpin (south aspect)	3r	Moderate	Moderate	Moderate	Slight	Northern red oak Yellow-poplar	70 80	Japanese larch, Virginia pine, eastern white pine.
Upshur (south aspect)	4c	Severe	Severe	Slight	Slight	Northern red oak Virginia pine Black oak White oak	60 60 60 60	Virginia pine, eastern white pine.
HaA, HaB Hackers	1o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Black walnut Black locust White ash	80 90	Eastern white pine, black walnut, yellow-poplar.
KaA, KaB Kanawha	2o	Slight	Slight	Slight	Slight	Northern red oak Black oak White oak Yellow-poplar White ash Black walnut Black locust	80 80 80 90 80	Eastern white pine, yellow-poplar, black walnut, Norway spruce, black locust.
LaD, LaE Laidig	2r	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Virginia pine Black walnut Black locust White ash	80 90 75	Eastern white pine, yellow-poplar, black walnut, Norway spruce, black locust.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	[1]Site index	
LdB, LdC---------- Laidig	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine,
						Yellow-poplar-------	90	yellow-poplar,
						Virginia pine-------	75	black walnut,
						Black walnut--------		Norway spruce,
						Black locust--------		black locust.
						White ash-----------		
MgB---------- Monongahela	3w	Slight	Moderate	Slight	Slight	Northern red oak----	70	Eastern white pine,
						Yellow-poplar-------	80	Virginia pine,
						Eastern white pine--	80	Japanese larch.
						Virginia pine-------	70	
						White oak-----------	70	
MgC---------- Monongahela	3w	Moderate	Moderate	Slight	Slight	Northern red oak----	70	Eastern white pine,
						Yellow-poplar-------	80	Virginia pine,
						Eastern white pine--	80	yellow-poplar,
						Virginia pine-------	70	Japanese larch.
						White oak-----------	70	
Mo---------- Moshannon	1o	Slight	Slight	Slight	Slight	Northern red oak----	85	Eastern white pine,
						Yellow-poplar-------	95	black walnut,
						Sugar maple---------		yellow-poplar,
						Black walnut--------		white ash,
						White ash-----------		Norway spruce.
Se---------- Senecaville	1w	Slight	Moderate	Slight	Slight	Northern red oak----	85	Eastern white pine,
						Yellow-poplar-------	95	yellow-poplar,
						Black walnut--------		Norway spruce.
						White ash-----------		
Sn---------- Sensabaugh	2o	Slight	Slight	Slight	Slight	Yellow-poplar-------	95	Yellow-poplar,
						White oak-----------	80	black walnut,
						Virginia pine-------	75	eastern white pine.
						Black walnut--------		
Ty---------- Tyler	2d	Slight	Moderate	Moderate	Moderate	Northern red oak----	80	Eastern white pine,
						Yellow-poplar-------	90	yellow-poplar,
						Pin oak-------------	90	Norway spruce,
						Red maple-----------		Japanese larch.
						White ash-----------		
[2]Uk: Urban land.								
Kanawha----------	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine,
						Black oak-----------	80	yellow-poplar,
						White oak-----------	80	black walnut,
						Yellow-poplar-------	90	Norway spruce,
						White ash-----------	80	black locust.
						Black walnut--------		
						Black locust--------		
[2]Ut: Urban land.								
Tyler----------	2d	Slight	Moderate	Moderate	Moderate	Northern red oak----	80	Eastern white pine,
						Yellow-poplar-------	90	yellow-poplar,
						Pin oak-------------	90	Norway spruce,
						Red maple-----------		Japanese larch.
						White ash-----------		
VaB, VaC---------- Vandalia	3c	Moderate	Moderate	Slight	Slight	Northern red oak----	70	Eastern white pine,
						Yellow-poplar-------	80	yellow-poplar,
						White oak-----------	70	black walnut,
						Black walnut--------		Virginia pine.
						Black locust--------		

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	[1]Site index	
VaD---------- (north aspect) Vandalia	2c	Severe	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- White oak---------- Black walnut-------- Black locust--------	80 90 80	Eastern white pine, yellow-poplar, black walnut.
VaD---------- (south aspect) Vandalia	3c	Severe	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- White oak---------- Black walnut-------- Black locust--------	70 80 70	Eastern white pine, Virginia pine, yellow-poplar, black walnut.
VaE---------- (north aspect) Vandalia	2c	Severe	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- White oak---------- Black walnut-------- Black locust--------	80 90 80	Eastern white pine, yellow-poplar, black walnut.
VaE---------- (south aspect) Vandalia	3c	Severe	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- White oak---------- Black walnut-------- Black locust--------	70 80 70	Eastern white pine, Virginia pine, yellow-poplar, black walnut.
VdC3----------	3c	Moderate	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- White oak---------- Black walnut-------- Black locust--------	70 80 70	Eastern white pine, yellow-poplar, black walnut, Virginia pine.
VdD3---------- (north aspect) Vandalia	2c	Severe	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- White oak---------- Black walnut-------- Black locust--------	80 90 80	Eastern white pine, yellow-poplar, black walnut.
VdD3---------- (south aspect) Vandalia	3c	Severe	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- White oak---------- Black walnut-------- Black locust--------	70 80 70	Eastern white pine, Virginia pine, yellow-poplar, black walnut.
VdE3---------- (north aspect) Vandalia	2c	Severe	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- White oak---------- Black walnut-------- Black locust--------	80 90 80	Eastern white pine, yellow-poplar, black walnut.
VdE3---------- (south aspect) Vandalia	3c	Severe	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- White oak---------- Black walnut-------- Black locust--------	70 80 70	Eastern white pine, Virginia pine, yellow-poplar, black walnut.
VeB, VeC---------- Vincent	2c	Slight	Moderate	Moderate	Slight	Northern red oak---- White oak---------- Yellow-poplar------- White ash---------- Sugar maple---------	80 80 80	Eastern white pine, yellow-poplar.
VnC3---------- Vincent	2c	Slight	Moderate	Moderate	Slight	Northern red oak---- White oak---------- Yellow-poplar------- White ash---------- Sugar maple---------	80 80 80	Eastern white pine, yellow-poplar.

[1]The site index shown is the midpoint of the site class, which has a range of plus or minus 5 from the figure shown.

[2]See map unit description for the composition and behavior of the entire unit.

TABLE 8.--BUILDING SITE DEVELOPMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AgB---------- Allegheny	Moderate: too clayey.	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength.	Slight.
AgC---------- Allegheny	Moderate: slope, too clayey.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope.
CaC---------- Clymer	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.	Moderate: slope.
[1]CDD, [1]CDE, [1]CDF: Clymer----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Dekalb----------	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
CoB---------- Coolville	Severe: too clayey.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Slight.
CoC---------- Coolville	Severe: too clayey.	Severe: low strength.	Severe: low strength.	Severe: slope, low strength.	Severe: low strength.	Moderate: slope.
CrC3---------- Coolville	Severe: too clayey.	Severe: low strength.	Severe: low strength.	Severe: slope, low strength.	Severe: low strength.	Moderate: too clayey, slope.
Ct---------- Cotaco	Severe: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.	Slight.
[1]Dm. Dumps						
[1]FL. Fluvaquents						
GlC---------- Gilpin	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Moderate: slope, depth to rock.
GlD, GlE---------- Gilpin	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]GpC: Gilpin----------	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Moderate: slope, depth to rock.
Upshur----------	Severe: too clayey, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Moderate: slope.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
[1]GpD, [1]GRE, [1]GRF: Gilpin	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur	Severe: slope, too clayey, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, slip hazard.
[1]GsC3: Gilpin	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Moderate: slope, depth to rock.
Upshur	Severe: too clayey, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Moderate: slope, too clayey.
[1]GsD3, [1]GUE3: Gilpin	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur	Severe: slope, too clayey, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, slip hazard.
HaA, HaB Hackers	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.	Slight.
KaA, KaB Kanawha	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.	Slight.
LaD, LaE Laidig	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
LdB Laidig	Moderate: wetness, small stones.	Slight	Moderate: wetness.	Moderate: slope.	Slight	Moderate: small stones.
LdC Laidig	Moderate: small stones, wetness, slope.	Moderate: slope.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope.	Moderate: slope, small stones.
MgB Monongahela	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: low strength.	Slight.
MgC Monongahela	Moderate: slope, wetness.	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope.
Mo Moshannon	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
[1]Qu. Quarries						

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Se---------- Senecaville	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.	Moderate: floods.
Sn---------- Sensabaugh	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Ty---------- Tyler	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.	Moderate: wetness.
[1]UA, [1]UB. Udifluvents						
[1]UC, [1]UD. Udorthents						
[1]Ue, [1]Uf. Urban land						
[1]Uk: Urban land.						
Kanawha----------	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.	Slight.
[1]Ut: Urban land.						
Tyler----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.	Moderate: wetness.
VaB---------- Vandalia	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Slight.
VaC---------- Vandalia	Severe: too clayey, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Moderate: slope.
VaD, VaE---------- Vandalia	Severe: slope, too clayey, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, slip hazard.
VdC3---------- Vandalia	Severe: too clayey, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: shrink-swell, low strength, slip hazard.	Moderate: slope, too clayey.
VdD3, VdE3-------- Vandalia	Severe: slope, too clayey, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, shrink-swell, low strength, slip hazard.	Severe: slope, slip hazard.
VeB---------- Vincent	Severe: too clayey.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Slight.
VeC, VnC3--------- Vincent	Severe: too clayey.	Severe: low strength.	Severe: low strength.	Severe: slope, low strength.	Severe: low strength.	Moderate: slope.

[1]See the map unit description for the composition and behavior of the entire unit.

TABLE 9.--SANITARY FACILITIES

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry means soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AgB Allegheny	Moderate: percs slowly.	Moderate: slope, seepage, depth to rock.	Severe: depth to rock.	Slight	Good.
AgC Allegheny	Moderate: slope, percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: slope.
CaC Clymer	Moderate: slope, depth to rock.	Severe: slope.	Severe: seepage, depth to rock.	Severe: seepage.	Fair: slope.
[1]CDD: Clymer	Severe: slope.	Severe: slope.	Severe: seepage, depth to rock.	Severe: slope, seepage.	Poor: slope.
Dekalb	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, small stones.
[1]CDE, [1]CDF: Clymer	Severe: slope.	Severe: slope.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope.
Dekalb	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, small stones.
CoB Coolville	Severe: percs slowly, wetness.	Moderate: slope, depth to rock.	Severe: depth to rock, too clayey.	Moderate: wetness.	Poor: too clayey.
CoC, CrC3 Coolville	Severe: percs slowly, wetness.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: slope, wetness.	Poor: too clayey.
Ct Cotaco	Severe: wetness.	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
[1]Dm. Dumps					
[1]FL. Fluvaquents					
GlC Gilpin	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Fair: thin layer, slope.
GlD Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GlE---------- Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
[1]GpC: Gilpin----------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Fair: thin layer.
Upshur----------	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
[1]GpD: Gilpin----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
Upshur----------	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope, too clayey.
[1]GRE, [1]GRF: Gilpin----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Upshur----------	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey.
[1]GsC3: Gilpin----------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Fair: thin layer.
Upshur----------	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
[1]GsD3: Gilpin----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
Upshur----------	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope, too clayey.
[1]GUE3: Gilpin----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Upshur----------	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey.
HaA, HaB---------- Hackers	Moderate[2]: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
KaA, KaB---------- Kanawha	Moderate[2]: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
LaD---------- Laidig	Severe: slope, percs slowly, wetness.	Severe: slope.	Moderate: wetness.	Severe: slope.	Poor: slope.

See footnotes at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LaE--- Laidig	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
LdB--- Laidig	Severe: percs slowly, wetness.	Moderate: slope, small stones, seepage.	Moderate: wetness.	Moderate: wetness.	Fair: small stones.
LdC--- Laidig	Severe: percs slowly, wetness.	Severe: slope.	Moderate: wetness.	Moderate: slope, wetness.	Fair: slope, small stones.
MgB--- Monongahela	Severe: percs slowly, wetness.	Moderate: slope, seepage.	Moderate: wetness.	Moderate: wetness.	Good.
MgC--- Monongahela	Severe: percs slowly, wetness.	Severe: slope.	Moderate: wetness.	Moderate: slope, wetness.	Fair: slope.
Mo--- Moshannon	Severe[2]: floods, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Good.
[1]Qu. Quarries					
Se--- Senecaville	Severe[2]: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Good.
Sn--- Sensabaugh	Severe[2]: floods.	Severe: floods, seepage.	Severe: floods, seepage, wetness.	Severe: floods, seepage.	Fair: small stones.
Ty--- Tyler	Severe: percs slowly, wetness.	Slight---	Severe: wetness.	Severe: wetness.	Fair: too clayey.
[1]UA, [1]UB. Udifluvents					
[1]UC, [1]UD. Udorthents					
[1]Ue, [1]Uf. Urban land					
[1]Uk: Urban land.					
Kanawha---	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
[1]Ut: Urban land.					
Tyler---	Severe: percs slowly, wetness.	Slight---	Severe: wetness.	Severe: wetness.	Fair: too clayey.
VaB--- Vandalia	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight---	Poor: too clayey, thin layer.

See footnotes at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
VaC---------- Vandalia	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, thin layer.
VaD---------- Vandalia	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope, too clayey, thin layer.
VaE---------- Vandalia	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey, thin layer.
VdC3---------- Vandalia	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, thin layer.
VdD3---------- Vandalia	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope, too clayey, thin layer.
VdE3---------- Vandalia	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey, thin layer.
VeB---------- Vincent	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey.
VeC, VnC3---------- Vincent	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey.	Moderate: slope, wetness.	Poor: too clayey.

[1]See the map unit description for the composition and behavior of the entire unit.
[2]Permeable materials may contribute to contamination of ground water.

TABLE 10.--CONSTRUCTION MATERIALS

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry means soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AgB Allegheny	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
AgC Allegheny	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
CaC Clymer	Fair: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
[1]CDD: Clymer	Fair: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Dekalb	Poor: thin layer.	Poor: excess fines.	Poor: excess fines.	Poor: slope, small stones.
[1]CDE, [1]CDF: Clymer	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Dekalb	Poor: slope, thin layer.	Poor: excess fines.	Poor: excess fines.	Poor: slope, small stones.
CoB Coolville	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
CoC, CrC3 Coolville	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey.
Ct Cotaco	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
[1]Dm. Dumps				
[1]FL. Fluvaquents				
GlC Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer, small stones.
GlD Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
GlE Gilpin	Poor: thin layer, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
[1]GpC: Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer, small stones.
Upshur	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, too clayey.
[1]GpD: Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Upshur	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, too clayey.
[1]GRE, [1]GRF: Gilpin	Poor: thin layer, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Upshur	Poor: slope, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, too clayey.
[1]GsC3: Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer, small stones.
Upshur	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, too clayey.
[1]GsD3: Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Upshur	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, too clayey.
[1]GUE3: Gilpin	Poor: thin layer, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Upshur	Poor: slope, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, too clayey.
HaA, HaB Hackers	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
KaA, KaB Kanawha	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
LaD---------- Laidig	Fair: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
LaE---------- Laidig	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
LdB, LdC---------- Laidig	Good----------	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
MgB---------- Monongahela	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
MgC---------- Monongahela	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
Mo---------- Moshannon	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
[1]Qu. Quarries				
Se---------- Senecaville	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Sn---------- Sensabaugh	Good----------	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones.
Ty---------- Tyler	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
[1]UA, [1]UB. Udifluvents				
[1]UC, [1]UD. Udorthents				
[1]Ue, [1]Uf. Urban land				
[1]Uk: Urban land.				
Kanawha----------	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
[1]Ut: Urban land.				
Tyler----------	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
VaB, VaC---------- Vandalia	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, too clayey.
VaD---------- Vandalia	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, too clayey.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
VaE---------- Vandalia	Poor: slope, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, too clayey.
VdC3---------- Vandalia	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, too clayey.
VdD3---------- Vandalia	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, too clayey.
VdE3---------- Vandalia	Poor: slope, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, too clayey.
VeB---------- Vincent	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
VeC, VnC3---------- Vincent	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey.

[1]See the map unit description for the composition and behavior of the entire unit.

TABLE 11.--WATER MANAGEMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. Absence of an entry means soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
AgB, AgC---------- Allegheny	Slope, seepage.	Low strength, piping.	Not needed-------	Slope, piping.	Slope.
CaC---------- Clymer	Slope, depth to rock, seepage.	Piping----------	Not needed-------	Slope----------	Slope.
[1]CDD, [1]CDE, [1]CDF: Clymer----------	Slope, depth to rock, seepage.	Piping----------	Not needed-------	Slope----------	Slope.
Dekalb----------	Slope, depth to rock, seepage.	Piping, seepage, thin layer.	Not needed-------	Slope, depth to rock.	Slope, droughty, depth to rock.
CoB---------- Coolville	Favorable---------	Low strength, hard to pack.	Percs slowly-----	Percs slowly, erodes easily.	Percs slowly, erodes easily.
CoC, CrC3--------- Coolville	Slope----------	Low strength, hard to pack.	Slope, percs slowly.	Percs slowly, erodes easily.	Slope, percs slowly, erodes easily.
Ct---------- Cotaco	Seepage----------	Low strength, piping.	Favorable--------	Not needed-------	Slope, erodes easily.
[1]Dm. Dumps					
[1]FL. Fluvaquents					
GlC, GlD, GlE----- Gilpin	Slope, depth to rock, seepage.	Thin layer--------	Not needed-------	Slope, depth to rock.	Slope, depth to rock.
[1]GpC, [1]GpD, [1]GRE, [1]GRF, [1]GsC3, [1]GsD3, [1]GUE3: Gilpin---------	Slope, depth to rock, seepage.	Thin layer--------	Not needed-------	Slope, depth to rock.	Slope, depth to rock.
Upshur----------	Slope----------	Low strength, compressible.	Not needed, cutbanks cave.	Erodes easily, slope.	Erodes easily, slope.
HaA, HaB---------- Hackers	Seepage----------	Piping, hard to pack, low strength.	Not needed-------	Slope, piping.	Slope.
KaA, KaB---------- Kanawha	Seepage----------	Low strength, piping, hard to pack.	Not needed-------	Slope, piping.	Slope.
LaD, LaE, LdB, LdC---------- Laidig	Slope, seepage.	Favorable---------	Not needed-------	Slope----------	Slope.
MgB, MgC---------- Monongahela	Slope, seepage.	Low strength, piping.	Slope, percs slowly.	Percs slowly, piping, rooting depth.	Slope, percs slowly, erodes easily, rooting depth.
Mo---------- Moshannon	Seepage----------	Low strength, piping.	Not needed-------	Not needed-------	Not needed.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
[1]Qu. Quarries					
Se---------- Senecaville	Seepage----------	Piping, low strength.	Floods----------	Not needed-------	Not needed.
Sn---------- Sensabaugh	Seepage----------	Favorable---------	Not needed-------	Not needed-------	Not needed.
Ty---------- Tyler	Favorable---------	Piping, low strength.	Percs slowly-----	Wetness, percs slowly, piping.	Wetness, percs slowly.
[1]UA, [1]UB. Udifluvents					
[1]UC, [1]UD. Udorthents					
[1]Ue, [1]Uf. Urban land					
[1]Uk: Urban land.					
Kanawha----------	Seepage----------	Low strength, piping, hard to pack.	Not needed-------	Slope, piping.	Slope.
[1]Ut: Urban land.					
Tyler----------	Favorable---------	Piping, low strength.	Percs slowly-----	Wetness, percs slowly, piping.	Wetness, percs slowly.
VaB, VaC, VaD, VaE, VdC3, VdD3, VdE3---------- Vandalia	Slope----------	Low strength, compressible.	Not needed, cutbanks cave.	Slope, erodes easily.	Slope, erodes easily.
VeB---------- Vincent	Favorable---------	Hard to pack, low strength.	Not needed-------	Erodes easily, percs slowly.	Erodes easily, percs slowly.
VeC, VnC3--------- Vincent	Slope----------	Hard to pack, low strength.	Not needed-------	Erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

[1]See the map unit description for the composition and behavior of the entire unit.

TABLE 12.--RECREATIONAL DEVELOPMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AgB Allegheny	Slight	Slight	Moderate: slope.	Slight	Slight.
AgC Allegheny	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
CaC Clymer	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
[1]CDD: Clymer	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.	Severe: slope.
Dekalb	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.	Severe: slope.
[1]CDE, [1]CDF: Clymer	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Dekalb	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
CoB Coolville	Moderate: percs slowly, wetness.	Slight	Moderate: slope, wetness, percs slowly.	Slight	Slight.
CoC Coolville	Moderate: slope, wetness, percs slowly.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
CrC3 Coolville	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: too clayey, slope.
Ct Cotaco	Moderate: wetness.	Slight	Moderate: slope, wetness.	Slight	Slight.
[1]Dm. Dumps					
[1]FL. Fluvaquents					
GlC Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, depth to rock.
GlD Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
GlE---- Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]GpC: Gilpin----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----	Moderate: slope, depth to rock.
Upshur----	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight----	Moderate: slope.
[1]GpD: Gilpin----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Upshur----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
[1]GRE, [1]GRF: Gilpin----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]GsC3: Gilpin----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----	Moderate: slope, depth to rock.
Upshur----	Moderate: slope, too clayey, percs slowly.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: slope, too clayey.
[1]GsD3: Gilpin----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Upshur----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.
[1]GUE3: Gilpin----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
HaA---- Hackers	Moderate: floods.	Slight----	Slight----	Slight----	Slight.
HaB---- Hackers	Moderate: floods.	Slight----	Moderate: slope.	Slight----	Slight.
KaA---- Kanawha	Moderate: floods.	Slight----	Slight----	Slight----	Slight.
KaB---- Kanawha	Moderate: floods.	Slight----	Moderate: slope.	Slight----	Slight.
LaD---- Laidig	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.	Severe: slope.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LaE--- Laidig	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
LdB--- Laidig	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: small stones.
LdC--- Laidig	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.	Moderate: slope, small stones.
MgB--- Monongahela	Moderate: wetness, percs slowly.	Slight---	Moderate: slope, wetness, percs slowly.	Slight---	Slight.
MgC--- Monongahela	Moderate: wetness, slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight---	Moderate: slope.
Mo--- Moshannon	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight---	Moderate: floods.
[1]Qu. Quarries					
Se--- Senecaville	Severe: floods.	Moderate: floods.	Moderate: floods, wetness.	Slight---	Moderate: floods.
Sn--- Sensabaugh	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight---	Moderate: floods.
Ty--- Tyler	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
[1]UA, [1]UB. Udifluvents					
[1]UC, [1]UD. Udorthents					
[1]Ue, [1]Uf. Urban land					
[1]Uk: Urban land.					
Kanawha---	Moderate: floods.	Slight---	Slight---	Slight---	Slight.
[1]Ut: Urban land.					
Tyler---	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
VaB--- Vandalia	Moderate: percs slowly.	Slight---	Moderate: slope, percs slowly.	Slight---	Slight.
VaC--- Vandalia	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight---	Moderate: slope.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
VaD---------- Vandalia	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
VaE---------- Vandalia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VdC3---------- Vandalia	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: slope, too clayey.
VdD3---------- Vandalia	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.
VdE3---------- Vandalia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VeB---------- Vincent	Moderate: percs slowly.	Slight----------	Moderate: percs slowly, slope.	Slight----------	Slight.
VeC---------- Vincent	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
VnC3---------- Vincent	Moderate: percs slowly, too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: slope, too clayey.

[1]See the map unit description for the composition and behavior of the entire unit.

TABLE 13.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AgB---- Allegheny	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AgC---- Allegheny	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CaC---- Clymer	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
[1]CDD:										
Clymer----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Dekalb----	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
[1]CDE:										
Clymer----	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Dekalb----	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
[1]CDF:										
Clymer----	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Dekalb----	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
CoB---- Coolville	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CoC, CrC3---- Coolville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ct---- Cotaco	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
[1]Dm. Dumps										
[1]FL. Fluvaquents										
GlC---- Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
GlD---- Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
GlE---- Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
[1]GpC:										
Gilpin----	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Upshur----	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
[1]GpD: Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Upshur	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
[1]GRE: Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Upshur	Very poor.	Fair	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
[1]GRF: Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Upshur	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
[1]GsC3: Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Upshur	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
[1]GsD3: Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Upshur	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
[1]GUE3: Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Upshur	Very poor.	Fair	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
HaA---- Hackers	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HaB---- Hackers	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KaA---- Kanawha	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KaB---- Kanawha	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LaD---- Laidig	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
LaE---- Laidig	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
LdB---- Laidig	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
LdC---- Laidig	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
MgB---- Monongahela	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MgC---- Monongahela	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Mo---- Moshannon	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
[1]Qu. Quarries										
Se---- Senecaville	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Sn---- Sensabaugh	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ty---- Tyler	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
[1]UA, [1]UB. Udifluvents										
[1]UC, [1]UD. Udorthents										
[1]Ue, [1]Uf. Urban land										
[1]Uk: Urban land.										
Kanawha----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
[1]Ut: Urban land.										
Tyler----	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
VaB---- Vandalia	Fair	Good	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
VaC---- Vandalia	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
VaD---- Vandalia	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
VaE---- Vandalia	Very poor.	Fair	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
VdC3---- Vandalia	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
VdD3---- Vandalia	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
VdE3---- Vandalia	Very poor.	Fair	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
VeB---- Vincent	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
VeC, VnC3---------- Vincent	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

[1]See the map unit description for the composition and behavior of the entire unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means greater than. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AgB, AgC---------- Allegheny	0-9	Loam----------	ML, CL, CL-ML	A-4	0	90-100	85-100	70-95	50-75	<35	NP-10
	9-33	Clay loam, loam, sandy clay loam.	CL-ML, CL, ML	A-4, A-6, A-7-6	0	90-100	85-100	70-100	35-80	25-45	5-15
	33-49	Clay loam, sandy clay loam, gravelly sandy loam.	SM, SC, ML	A-4, A-6, A-2	0-5	65-100	55-100	35-95	20-75	25-45	5-15
	49-66	Silty clay, silty clay loam.	CL, CL-ML	A-4, A-6, A-7-6	0	90-100	85-100	80-100	75-95	25-45	5-15
CaC---------- Clymer	0-12	Loam----------	ML, SM	A-4	0-5	85-100	75-95	60-90	35-85	---	---
	12-37	Channery clay loam, channery loam, channery sandy clay loam.	GM, SM, GC, ML	A-2, A-4	0-20	60-95	50-95	45-85	30-60	14-32	NP-9
	37-52	Channery loam, very channery loam, channery sandy loam.	GM, GP, GC, SM	A-1, A-2, A-4	10-30	30-75	25-70	20-60	5-40	14-32	NP-9
	52	Weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]CDD, [1]CDE, [1]CDF: Clymer----------	0-12	Channery loam---	ML, SM, GM	A-2, A-4	0-15	60-80	50-70	45-65	30-60	---	---
	12-37	Channery clay loam, channery loam, channery sandy clay loam.	GM, SM, GC, ML	A-2, A-4	0-20	60-95	50-95	45-85	30-60	14-32	NP-9
	37-52	Channery loam, very channery loam, channery sandy loam.	GM, GP, GC, SM	A-1, A-2, A-4	10-30	30-75	25-70	20-60	5-40	14-32	NP-9
	52	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Dekalb----------	0-3	Channery sandy loam.	SM, GM, ML, CL	A-2, A-4	0-30	50-90	45-80	40-75	20-55	10-32	NP-7
	3-30	Channery sandy loam, channery loam, very channery sandy loam.	SM, GM, ML	A-2, A-4	5-40	50-85	40-80	40-75	20-55	15-32	NP-7
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CoB, CoC---------- Coolville	0-7	Silt loam-------	ML, CL-ML	A-4, A-6	0	90-100	85-100	80-100	70-90	25-40	4-12
	7-22	Silty clay loam	CL	A-7, A-6	0	95-100	90-100	85-100	80-95	35-48	15-25
	22-60	Clay, silty clay	CH	A-7	0-5	95-100	90-100	90-100	75-95	52-62	28-40
	60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
CrC3---------- Coolville	0-7	Silty clay loam	CL	A-6, A-4	0	90-100	85-100	80-100	75-100	25-40	8-18
	7-22	Silty clay loam	CL	A-7, A-6	0	95-100	90-100	85-100	80-95	35-48	15-25
	22-60	Clay, silty clay	CH	A-7	0-5	95-100	90-100	90-100	75-95	52-62	28-40
	60	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ct---------- Cotaco	0-14	Loam----------	ML, CL-ML, SM, SM-SC	A-4	0-5	80-100	75-95	55-85	35-80	<30	NP-7
	14-60	Gravelly sandy clay loam, clay loam, loam.	SC, SM, GC, CL	A-2, A-4, A-6	0-10	60-100	50-95	40-70	20-70	<35	NP-15
[1]Dm. Dumps											
[1]FL. Fluvaquents											
G1C, G1D, G1E------ Gilpin	0-11	Silt loam-------	ML, CL	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	11-30	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	30-35	Channery loam, very channery silt loam, very shaly silt loam.	GM, GC, SM, SC	A-2, A-4	0-35	25-55	20-50	15-45	15-40	25-40	4-10
	35	Weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]GpC, [1]GpD, [1]GRE, [1]GRF: Gilpin----------	0-11	Silt loam-------	ML, CL	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	11-30	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	30-35	Channery loam, very channery silt loam, very shaly silt loam.	GM, GC, SM, SC	A-2, A-4	0-35	25-55	20-50	15-45	15-40	25-40	4-10
	35	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Upshur----------	0-4	Silt loam-------	CL-ML, ML, CL	A-6, A-4	0	90-100	85-100	75-100	60-90	25-40	5-15
	4-28	Shaly silty clay, clay.	MH, CH, CL, ML	A-7	0	75-100	65-100	55-100	50-100	45-70	18-40
	28-36	Silty clay loam, shaly silty clay, clay.	CL, ML, MH	A-6, A-7	0	45-100	40-95	35-95	35-90	35-55	11-25
	36-67	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
[1]GsC3, [1]GsD3, [1]GUE3:											
Gilpin	0-11	Silt loam	ML, CL	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	11-30	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	30-35	Channery loam, very channery silt loam, very shaly silt loam.	GM, GC, SM, SC	A-2, A-4	0-35	25-55	20-50	15-45	15-40	25-40	4-10
	35	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Upshur	0-4	Silty clay loam	CL, ML	A-6, A-7	0	90-100	85-100	80-100	70-95	35-50	11-25
	4-28	Shaly silty clay, clay.	MH, CH, CL, ML	A-7	0	75-100	65-100	55-100	50-100	45-70	18-40
	28-36	Silty clay loam, shaly silty clay, clay.	CL, ML, MH	A-6, A-7	0	45-100	40-95	35-95	35-90	35-55	11-25
	36-67	Weathered bedrock.	---	---	---	---	---	---	---	---	---
HaA, HaB Hackers	0-11	Silt loam	ML, CL, SM, SM-SC	A-4, A-6	0	90-100	90-100	70-100	40-90	20-40	1-12
	11-60	Silt loam, clay loam, silty clay loam.	ML, CL	A-4, A-6	0	90-100	90-100	90-100	70-95	25-40	2-20
KaA, KaB Kanawha	0-9	Fine sandy loam	SM, ML	A-2, A-4	0	80-100	75-100	45-85	25-55	<40	NP-10
	9-16	Fine sandy loam, silt loam.	ML, CL, SM, SC	A-4, A-6, A-2	0	80-100	75-100	50-100	30-90	<40	NP-15
	16-52	Loam, sandy clay loam, clay loam.	SC, CL, ML, SM	A-2, A-4, A-6	0	80-100	75-100	60-100	25-80	25-40	2-15
	52-60	Fine sandy loam, gravelly fine sandy loam, sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	60-100	55-100	40-95	20-60	<40	NP-15
LaD, LaE Laidig	0-9	Channery sandy loam.	SM, GM, GM-GC, SM-SC	A-1, A-2, A-4	0-5	65-90	55-80	35-70	15-45	15-25	NP-5
	9-45	Channery loam, channery sandy clay loam, channery sandy loam.	SM, SC, ML, CL	A-1, A-2, A-4, A-6	5-10	70-95	55-90	40-80	20-70	15-40	2-18
	45-82	Channery sandy clay loam, channery loam, channery sandy loam.	GC, SC, GM-GC, CL-ML	A-1, A-2, A-4, A-6	5-40	50-90	40-85	30-80	15-70	15-35	2-16

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
LdB, LdC---------- Laidig	0-9	Channery loam---	GM, SM, ML, CL	A-4	0-5	65-90	55-80	50-80	35-70	20-30	1-10
	9-45	Channery loam, channery sandy clay loam, channery sandy loam.	SM, SC, ML, CL	A-1, A-2, A-4, A-6	5-10	70-95	55-90	40-80	20-70	15-40	2-18
	45-82	Channery sandy clay loam, channery loam, channery sandy loam.	GC, SC, GM-GC, CL-ML	A-1, A-2, A-4, A-6	5-40	50-90	40-85	30-80	15-70	15-35	2-16
MgB, MgC---------- Monongahela	0-10	Silt loam-------	ML, SM, CL-ML, SM-SC	A-4	0-5	90-100	85-100	75-100	45-90	20-35	1-10
	10-26	Loam, silt loam, clay loam.	ML, CL	A-4, A-6	0-10	90-100	90-100	80-100	70-90	20-40	5-15
	26-60	Loam, silt loam, sandy clay loam.	ML, CL, SM, SC	A-4, A-6	0-10	80-100	75-100	70-95	45-95	20-40	1-15
Mo---------- Moshannon	0-7	Silt loam-------	ML, CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	70-95	22-40	3-15
	7-44	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	90-100	85-95	25-40	3-15
	44-66	Stratified silt loam to fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	80-100	70-100	65-95	50-85	25-40	3-15
[1]Qu. Quarries											
Se---------- Senecaville	0-6	Silt loam-------	ML, CL, SM-SC, SM	A-4, A-6	0	90-100	85-100	70-100	40-90	20-40	1-12
	6-40	Silty clay loam, silt loam.	CL, ML	A-4, A-6	0	90-100	85-100	80-100	70-95	25-40	5-18
	40-60	Silt loam, fine sandy loam, loam.	ML, SM, SC, CL	A-4	0-5	90-100	70-85	65-80	40-80	20-40	1-15
Sn---------- Sensabaugh	0-10	Silt loam-------	CL-ML, CL, ML	A-4	0-5	90-100	75-95	65-85	55-75	16-29	3-9
	10-31	Gravelly loam, gravelly silt loam, silt loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	2-18	70-95	55-90	45-75	35-65	20-35	5-14
	31-48	Gravelly loam, gravelly sandy loam, very gravelly sandy loam.	SM-SC, SC, GM-GC, GC	A-4, A-6, A-2	5-30	35-65	25-60	25-55	20-45	20-36	6-15
Ty---------- Tyler	0-14	Silt loam-------	ML	A-4	0	100	100	95-100	80-95	30-40	4-10
	14-20	Silty clay loam, silt loam.	CL	A-6, A-7, A-4	0	100	100	95-100	85-100	25-45	8-20
	20-60	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7, A-4	0	100	100	80-100	70-95	25-45	8-20
[1]UA, [1]UB. Udifluvents											
[1]UC, [1]UD. Udorthents											

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
[1]Ue, [1]Uf. Urban land											
[1]Uk: Urban land.											
Kanawha	0-9	Fine sandy loam	SM, ML	A-2, A-4	0	80-100	75-100	45-85	25-55	<40	NP-10
	9-16	Fine sandy loam, silt loam.	ML, CL, SM, SC	A-4, A-6, A-2	0	80-100	75-100	50-100	30-90	<40	NP-15
	16-52	Loam, sandy clay loam, clay loam.	SC, CL, ML, SM	A-2, A-4, A-6	0	80-100	75-100	60-100	25-80	25-40	2-15
	52-60	Fine sandy loam, gravelly fine sandy loam, sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	60-100	55-100	40-95	20-60	<40	NP-15
[1]Ut: Urban land.											
Tyler	0-14	Silt loam	ML	A-4	0	100	100	95-100	80-95	30-40	4-10
	14-20	Silty clay loam, silt loam.	CL	A-6, A-7, A-4	0	100	100	95-100	85-100	25-45	8-20
	20-60	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7, A-4	0	100	100	80-100	70-95	25-45	8-20
VaB, VaC, VaD, VaE-Vandalia	0-4	Silt loam	ML, MH	A-4, A-6, A-7	0-5	80-100	75-100	70-100	50-95	35-55	5-20
	4-41	Silty clay loam, channery silty clay, clay.	CL, CH, GC	A-6, A-7	0-5	50-100	45-100	40-100	35-95	35-55	15-30
	41-72	Silty clay, clay, channery silty clay loam.	CL, CH, ML, GC	A-6, A-7	0-5	40-100	35-100	30-100	25-95	35-55	15-30
VdC3, VdD3, VdE3-Vandalia	0-4	Silty clay loam	ML, MH	A-4, A-6, A-7	0-5	80-100	75-100	70-100	50-95	35-55	5-20
	4-41	Silty clay loam, channery silty clay, clay.	CL, CH, GC	A-6, A-7	0-5	50-100	45-100	40-100	35-95	35-55	15-30
	41-72	Silty clay, clay, channery silty clay loam.	CL, CH, ML, GC	A-6, A-7	0-5	40-100	35-100	30-100	25-95	35-55	15-30
VeB, VeC-Vincent	0-8	Silt loam	ML, CL, CL-ML	A-6, A-4	0	100	100	95-100	80-95	25-40	4-14
	8-49	Silty clay, silty clay loam, clay.	CH, MH, CL	A-7, A-6	0	100	95-100	90-100	80-100	38-64	14-32
	49-64	Silty clay, silty clay loam, clay.	CH, MH, CL	A-7, A-6	0	100	95-100	85-100	75-100	38-64	14-32
VnC3-Vincent	0-8	Silty clay loam	ML, CL, CL-ML	A-6, A-4	0	100	100	95-100	80-95	25-40	4-14
	8-49	Silty clay, silty clay loam, clay.	CH, MH, CL	A-7, A-6	0	100	95-100	90-100	80-100	38-64	14-32
	49-64	Silty clay, silty clay loam, clay.	CH, MH, CL	A-7, A-6	0	100	95-100	85-100	75-100	38-64	14-32

[1]See the map unit description for the composition and behavior of the entire unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means greater then. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
AgB, AgC----------	0-9	0.6-2.0	0.15-0.22	6.1-6.5	Low-------	Moderate------	Moderate-------	0.32	3
Allegheny	9-33	0.6-2.0	0.13-0.18	4.5-5.5	Low-------	Moderate------	Moderate-------	0.32	
	33-49	0.6-2.0	0.13-0.18	4.5-5.5	Low-------	Moderate------	Moderate-------	0.32	
	49-66	0.06-0.6	0.08-0.16	5.6-6.0	Low-------	Moderate------	Moderate-------	0.32	
	66	---	---	---	----------	----------	----------	---	
CaC----------	0-12	0.6-6.0	0.10-0.16	4.5-5.5	Low-------	Low----------	High----------	0.28	3
Clymer	12-37	0.6-6.0	0.08-0.14	4.5-5.5	Low-------	Low----------	High----------	0.17	
	37-52	0.6-6.0	0.04-0.08	4.5-5.5	Low-------	Low----------	High----------	0.17	
	52	---	---	---	----------	----------	----------	---	
[1]CDD, [1]CDE, [1]CDF:									
Clymer----------	0-12	0.6-6.0	0.10-0.14	4.5-5.5	Low-------	Low----------	High----------	0.24	3
	12-37	0.6-6.0	0.08-0.14	4.5-5.5	Low-------	Low----------	High----------	0.17	
	37-52	0.6-6.0	0.04-0.08	4.5-5.5	Low-------	Low----------	High----------	0.17	
	52	---	---	---	----------	----------	----------	---	
Dekalb----------	0-3	2.0-20	0.08-0.12	4.5-6.5	Low-------	Low----------	High----------	0.24	3
	3-30	2.0-20	0.06-0.12	4.5-5.5	Low-------	Low----------	High----------	0.17	
	30	---	---	---	----------	----------	----------	---	
CoB, CoC----------	0-7	0.6-2.0	0.18-0.22	3.6-6.5	Low-------	Moderate------	High----------	0.43	4
Coolville	7-22	0.6-2.0	0.16-0.19	3.6-5.5	Moderate	High----------	High----------	0.43	
	22-60	<0.2	0.10-0.15	3.6-5.5	Moderate	High----------	High----------	0.32	
	60	---	---	---	----------	----------	----------	---	
CrC3----------	0-7	0.6-2.0	0.17-0.20	3.6-6.5	Low-------	High----------	High----------	0.43	3
Coolville	7-22	0.6-2.0	0.16-0.19	3.6-5.5	Moderate	High----------	High----------	0.43	
	22-60	<0.2	0.10-0.15	3.6-5.5	Moderate	High----------	High----------	0.32	
	60	---	---	---	----------	----------	----------	---	
Ct----------	0-14	0.6-6.0	0.12-0.20	3.6-5.5	Low-------	Moderate------	High----------	0.37	3
Cotaco	14-60	0.6-2.0	0.07-0.15	3.6-5.5	Low-------	Moderate------	High----------	0.28	
[1]Dm.									
Dumps									
[1]FL.									
Fluvaquents									
GlC, GlD, GlE------	0-11	0.6-2.0	0.12-0.18	4.5-5.5	Low-------	Low----------	High----------	0.32	3
Gilpin	11-30	0.6-2.0	0.10-0.16	4.5-5.5	Low-------	Low----------	High----------	0.28	
	30-35	0.6-2.0	0.06-0.10	4.5-5.5	Low-------	Low----------	High----------	0.28	
	35	---	---	---	----------	----------	----------	---	
[1]GpC, [1]GpD, [1]GRE, [1]GRF:									
Gilpin----------	0-11	0.6-2.0	0.12-0.18	4.5-5.5	Low-------	Low----------	High----------	0.32	3
	11-30	0.6-2.0	0.10-0.16	4.5-5.5	Low-------	Low----------	High----------	0.28	
	30-35	0.6-2.0	0.06-0.10	4.5-5.5	Low-------	Low----------	High----------	0.28	
	35	---	---	---	----------	----------	----------	---	
Upshur----------	0-4	0.6-2.0	0.12-0.16	4.5-6.5	Moderate	High----------	Moderate-------	0.43	3
	4-28	0.06-0.2	0.10-0.14	5.1-7.3	High------	High----------	Moderate-------	0.28	
	28-36	0.06-0.2	0.08-0.12	5.6-8.4	Moderate	High----------	Moderate-------	0.28	
	36-67	---	---	---	----------	----------	----------	---	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
[1]GsC3, [1]GsD3, [1]GUE3:									
Gilpin	0-11	0.6-2.0	0.12-0.18	4.5-5.5	Low	Low	High	0.32	3
	11-30	0.6-2.0	0.10-0.16	4.5-5.5	Low	Low	High	0.28	
	30-35	0.6-2.0	0.06-0.10	4.5-5.5	Low	Low	High	0.28	
	35	---	---	---	---	---	---	---	
Upshur	0-4	0.2-0.6	0.12-0.16	5.1-7.3	Moderate	High	Moderate	0.43	3
	4-28	0.06-0.2	0.10-0.14	5.1-7.3	High	High	Moderate	0.28	
	28-36	0.06-0.2	0.08-0.12	5.6-8.4	Moderate	High	Moderate	0.28	
	36-67	---	---	---	---	---	---	---	
HaA, HaB	0-11	0.6-2.0	0.18-0.24	5.1-6.5	Low	Low	Low		
Hackers	11-60	0.6-2.0	0.12-0.18	5.1-6.0	Moderate	Low	Low		
KaA, KaB	0-9	2.0-6.0	0.12-0.16	5.1-6.0	Low	Low	Moderate		
Kanawha	9-16	0.6-2.0	0.12-0.20	5.1-6.0	Low	Low	Moderate		
	16-52	0.6-2.0	0.14-0.18	5.1-6.5	Low	Low	Moderate		
	52-60	0.6-6.0	0.10-0.18	5.6-6.5	Low	Low	Moderate		
LaD, LaE	0-9	0.6-6.0	0.09-0.12	4.5-5.5	Low	Moderate	High	0.28	4
Laidig	9-45	0.6-6.0	0.08-0.12	4.5-5.5	Low	Moderate	High	0.28	
	45-82	0.2-0.6	0.06-0.10	4.5-5.5	Low	Moderate	High	0.17	
LdB, LdC	0-9	0.6-6.0	0.10-0.14	4.5-5.5	Low	Moderate	High	0.28	4
Laidig	9-45	0.6-6.0	0.08-0.12	4.5-5.5	Low	Moderate	High	0.28	
	45-82	0.2-0.6	0.06-0.10	4.5-5.5	Low	Moderate	High	0.17	
MgB, MgC	0-10	0.6-2.0	0.18-0.24	4.5-5.5	Low	Moderate	Moderate	0.43	3
Monongahela	10-26	0.6-2.0	0.14-0.18	4.5-5.5	Low	High	High	0.43	
	26-60	0.06-0.6	0.08-0.12	4.5-5.5	Low	High	High	0.37	
Mo	0-7	0.6-2.0	0.16-0.20	5.6-6.5	Low	Low	Moderate		
Moshannon	7-44	0.6-2.0	0.15-0.19	5.6-6.5	Low	Low	Moderate		
	44-66	0.6-2.0	0.14-0.18	5.6-6.5	Low	Low	Moderate		
[1]Qu. Quarries									
Se	0-6	0.6-2.0	0.18-0.24	5.1-6.5	Low	Moderate	Low		
Senecaville	6-40	0.2-2.0	0.12-0.18	5.1-6.5	Moderate	Moderate	Low		
	40-60	0.6-2.0	0.12-0.18	5.1-6.5	Low	Moderate	Moderate		
Sn	0-25	0.6-6.0	0.12-0.18	5.6-6.5	Low	Low	Low		
Sensabaugh	25-31	0.6-6.0	0.10-0.16	5.6-6.5	Low	Low	Low		
	31-48	0.6-6.0	0.08-0.14	5.6-6.5	Low	Low	Low		
Ty	0-14	0.6-2.0	0.18-0.22	4.5-6.5	Low	High	High	0.43	3
Tyler	14-20	0.2-0.6	0.16-0.20	4.5-5.5	Moderate	High	High	0.43	
	20-60	<0.2	0.04-0.12	4.5-5.5	Low	High	High	0.37	
[1]UA, [1]UB. Udifluvents									
[1]UC, [1]UD. Udorthents									
[1]Ue, [1]Uf. Urban land									
[1]Uk: Urban land.									

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
[1]Uk:									
Kanawha----------	0-9	2.0-6.0	0.12-0.16	5.1-6.0	Low-------	Low----------	Moderate-------		
	9-16	0.6-2.0	0.12-0.20	5.1-6.0	Low-------	Low----------	Moderate-------		
	16-52	0.6-2.0	0.14-0.18	5.1-6.5	Low-------	Low----------	Moderate-------		
	52-60	0.6-6.0	0.10-0.18	5.6-6.5	Low-------	Low----------	Moderate-------		
[1]Ut:									
Urban land.									
Tyler----------	0-14	0.6-2.0	0.18-0.22	4.5-6.5	Low-------	High----------	High----------	0.43	3
	14-20	0.2-0.6	0.16-0.20	4.5-5.5	Moderate	High----------	High----------	0.43	
	20-60	<0.2	0.04-0.12	4.5-5.5	Low-------	High----------	High----------	0.37	
VaB, VaC, VaD, VaE, VdC3, VdD3, VdE3-- Vandalia	0-4	0.6-2.0	0.12-0.18	5.1-6.0	Moderate	Moderate------	Moderate-------	0.37	4
	4-41	0.2-0.6	0.12-0.15	5.1-6.0	High------	Moderate------	Moderate-------	0.28	
	41-72	0.06-0.6	0.08-0.12	5.6-6.5	High------	High----------	Moderate-------	0.28	
VeB, VeC, VnC3----- Vincent	0-13	0.6-2.0	0.16-0.20	5.1-7.3	Moderate	Moderate------	High----------	0.43	3
	13-49	0.06-0.2	0.12-0.16	5.1-6.0	Moderate	High----------	High----------	0.32	
	49-64	0.06-0.2	0.10-0.15	5.6-7.3	Moderate	High----------	Low-----------	0.32	

[1]See the map unit description for the composition and behavior of the entire unit.

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See the Glossary for descriptions of symbols and such terms as "apparent" and "perched." The symbol < means less than; > means greater than]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness
					Ft			In	
AgB, AgC---------- Allegheny	B	None--------	---	---	>6.0	---	---	>48	Rippable
CaC---------- Clymer	B	None--------	---	---	>6.0	---	---	40-60	Hard
[1]CDD, [1]CDE, [1]CDF: Clymer----------	B	None--------	---	---	>6.0	---	---	40-60	Hard
Dekalb----------	C	None--------	---	---	>6.0	---	---	20-40	Hard
CoB, CoC, CrC3---- Coolville	C	None--------	---	---	1.5-2.5	Perched	Feb-Apr	48-60	Rippable
Ct---------- Cotaco	C	Rare--------	---	---	1.5-2.5	Apparent	Nov-May	>60	---
[1]Dm. Dumps									
[1]FL. Fluvaquents									
GlC, GlD, GlE----- Gilpin	C	None--------	---	---	>6.0	---	---	20-40	Rippable
[1]GpC, [1]GpD, [1]GRE, [1]GRF, [1]GsC3, [1]GsD3, [1]GUE3: Gilpin----------	C	None--------	---	---	>6.0	---	---	20-40	Rippable
Upshur----------	C	None--------	---	---	>6.0	---	---	>34	Rippable
HaA, HaB---------- Hackers	B	Rare--------	---	---	>6.0	---	---	>60	---
KaA, KaB---------- Kanawha	B	Rare--------	---	---	>6.0	---	---	>72	---
LaD, LaE, LdB, LdC---------- Laidig	C	None--------	---	---	2.5-4.0	Perched	Jan-Mar	>60	---
MgB, MgC---------- Monongahela	C	None--------	---	---	1.5-2.5	Perched	Dec-Apr	>60	---
Mo---------- Moshannon	B	Common------	Very brief	Jan-May	4.0-6.0	Apparent	Feb-Mar	>60	---
[1]Qu. Quarries									
Se---------- Senecaville	C	Common------	Very brief	Jan-Apr	1.5-2.5	Apparent	Dec-Apr	>48	Hard
Sn---------- Sensabaugh	B	Common------	Very brief	Jan-Apr	4.0-6.0	Apparent	Jan-Apr	>60	---
Ty---------- Tyler	D	None--------	---	---	0.5-1.5	Perched	Nov-May	>60	---
[1]UA, [1]UB. Udifluvents									

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness
					Ft			In	
[1]UC, [1]UD. Udorthents									
[1]Ue, [1]Uf. Urban land									
[1]Uk: Urban land.									
Kanawha----------	B	Rare--------	---	---	>6.0	---	---	>72	---
[1]Ut: Urban land.									
Tyler----------	D	None--------	---	---	0.5-1.5	Perched	Nov-May	>60	---
VaB, VaC, VaD, VaE, VdC3, VdD3, VdE3---------- Vandalia	C	None--------	---	---	4.0-6.0	Apparent	Dec-Apr	>72	---
VeB, VeC, VnC3---- Vincent	C	None--------	---	---	2.0-6.0	Perched	Jan-Apr	>60	---

[1]See the map unit description for the composition and behavior of the entire unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics of this taxadjunct that are outside the range of the series]

Soil name	Family or higher taxonomic class
Allegheny	Fine-loamy, mixed, mesic Typic Hapludults
Clymer	Fine-loamy, mixed, mesic Typic Hapludults
Coolville	Clayey, mixed, mesic Aquic Hapludults
Cotaco	Fine-loamy, mixed, mesic Aquic Hapludults
Dekalb	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Hackers	Fine-silty, mixed, mesic Typic Hapludalfs
Kanawha	Fine-loamy, mixed, mesic Typic Hapludalfs
Laidig	Fine-loamy, mixed, mesic Typic Fragiudults
Monongahela	Fine-loamy, mixed, mesic Typic Fragiudults
Moshannon	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Senecaville	Fine-silty, mixed, mesic Fluvaquentic Eutrochrepts
Sensabaugh	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Tyler	Fine-silty, mixed, mesic Aeric Fragiaquults
Upshur*	Fine, mixed, mesic Typic Hapludalfs
Vandalia	Fine, mixed, mesic Typic Hapludalfs
Vincent	Fine, mixed, mesic Typic Hapludalfs

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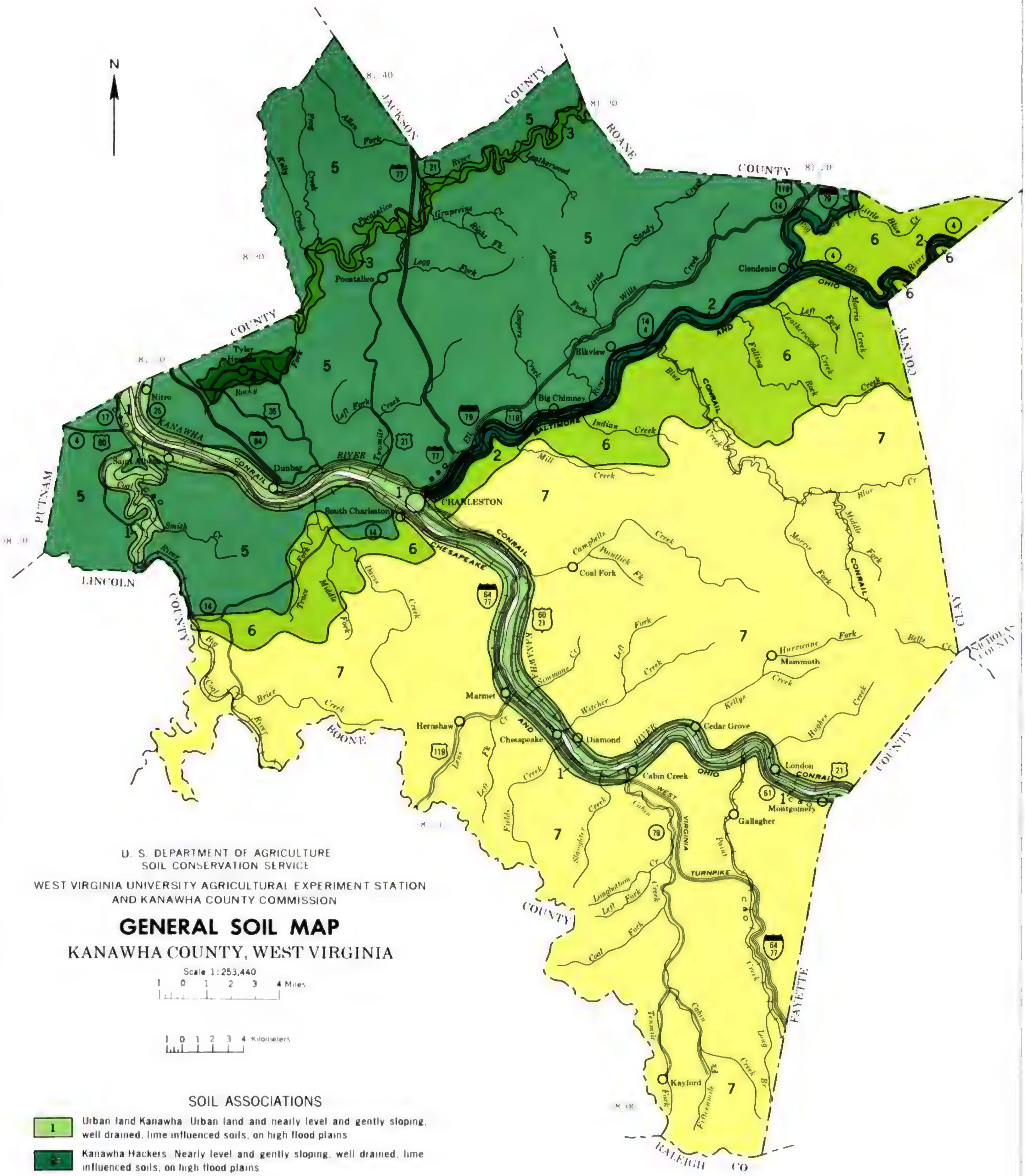


U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

WEST VIRGINIA UNIVERSITY AGRICULTURAL EXPERIMENT STATION
AND KANAWHA COUNTY COMMISSION

GENERAL SOIL MAP

KANAWHA COUNTY, WEST VIRGINIA

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 1 2 3 4 Kilometers

SOIL ASSOCIATIONS

1 Urban land Kanawha. Urban land and nearly level and gently sloping, well drained, lime influenced soils, on high flood plains

2 Kanawha Hackers. Nearly level and gently sloping, well drained, lime influenced soils, on high flood plains

3 Senecaville Hackers Vandalia. Nearly level to moderately steep, well drained and moderately well drained, lime influenced soils, on flood plains and foot slopes

4 Gilpin Upshur Vincent. Gently sloping to very steep, well drained and moderately well drained, acid soils and lime influenced soils, on uplands and old slackwater terraces

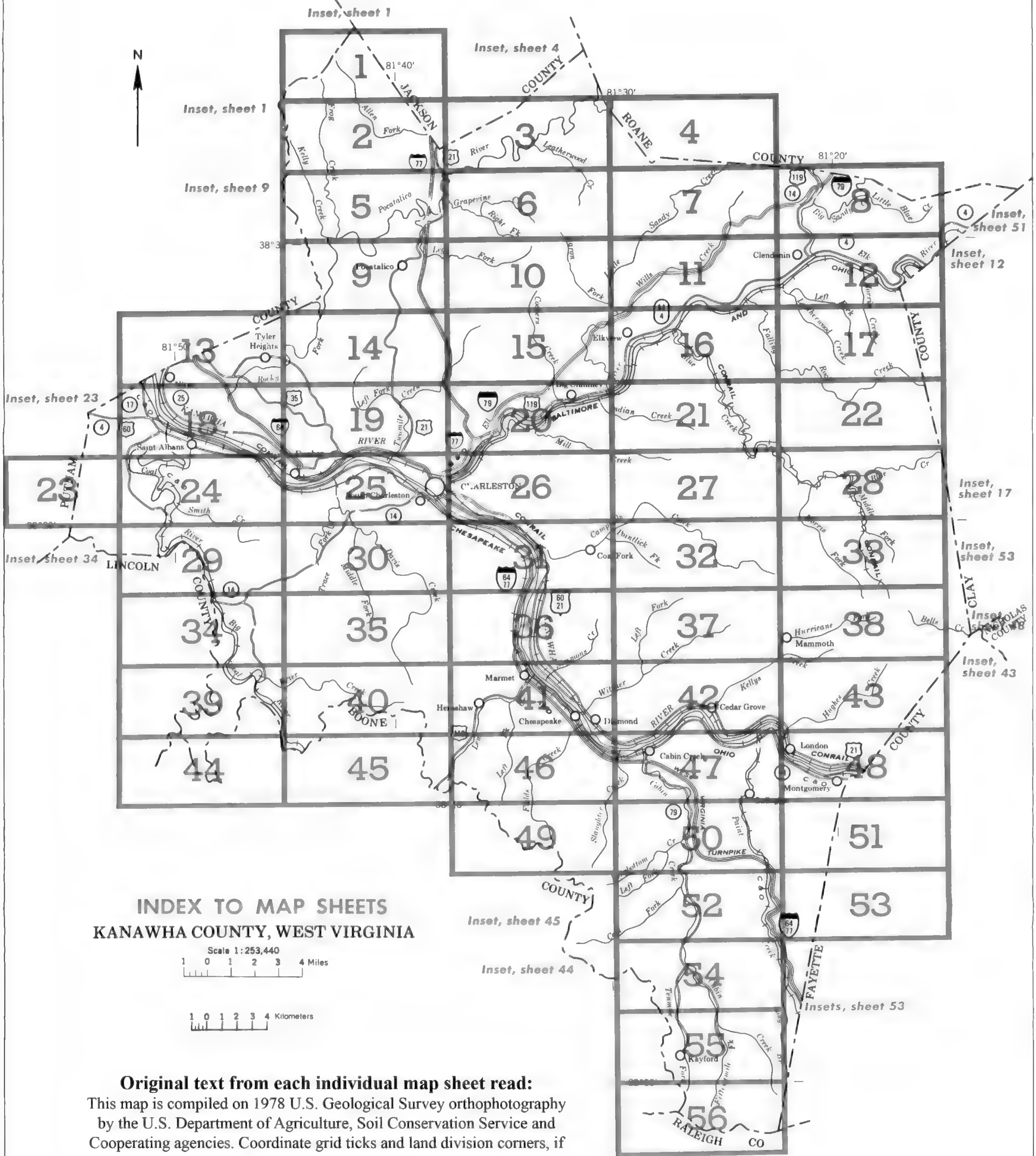
5 Gilpin Upshur Vandalia. Gently sloping to very steep, well drained, acid soils and lime influenced soils, on uplands and foot slopes

6 Clymer Gilpin Dekalb. Strongly sloping to very steep, well drained, acid soils, on uplands

7 Clymer Dekalb Gilpin. Strongly sloping to very steep, well drained, acid soils, on rugged uplands

Compiled 1979

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS

KANAWHA COUNTY, WEST VIRGINIA

Scale 1:253,440

Original text from each individual map sheet read:

This map is compiled on 1978 U.S. Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and Cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline
- AD HOC BOUNDARY (label)
- Small airport, airfield, park, oilfield, cemetery, or flood pool (Davis Airstrip; LAKE; POOL; LINE)
- STATE COORDINATE TICK
- LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate (70)
- Federal (418)
- State (52)
- County, farm or ranch (378)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (WATER)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (GAS)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (WATER)
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (CeA; FoB2)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

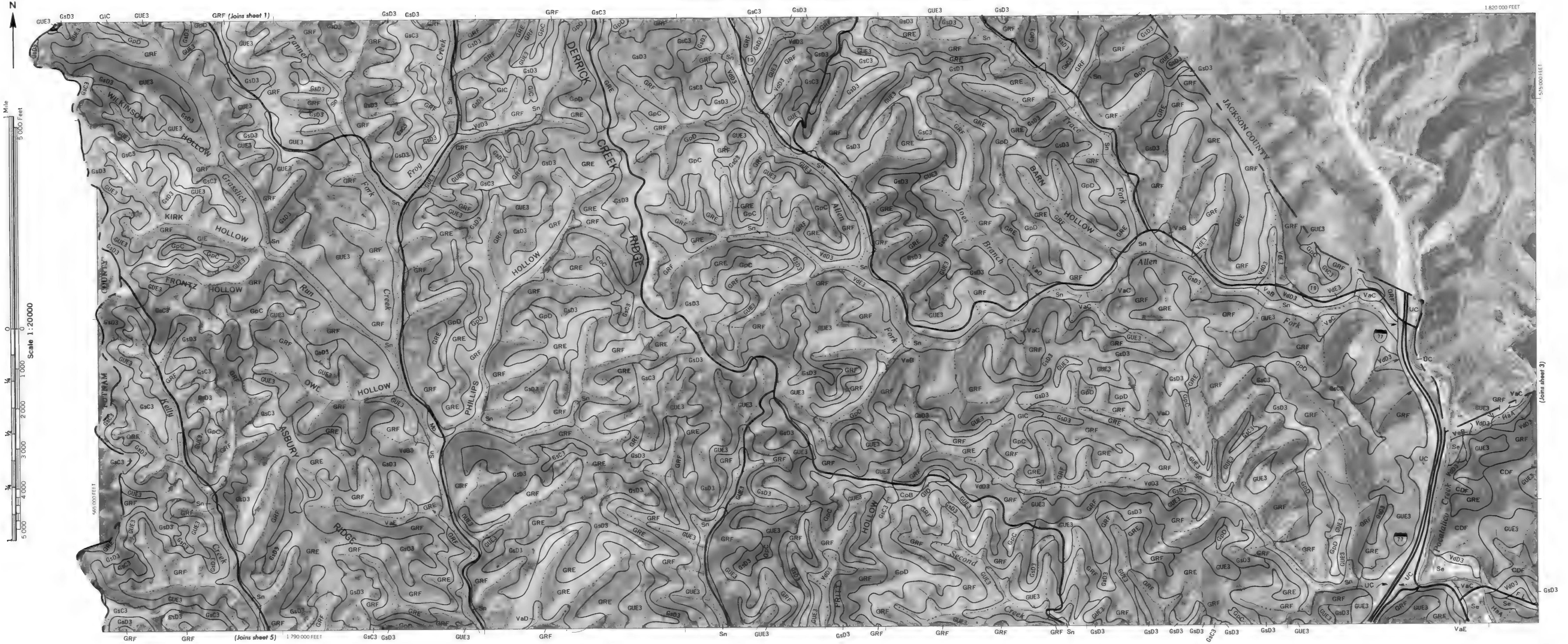
SOIL LEGEND

*The first letter, always a capital, is the inital letter of the soil name. The second letter is a capital if the mapping unit is broadly defined; otherwise, it is a small letter. The third letter, always a capital A, B, C, D, E, or F shows the slope. Most symbols without a letter are those of nearly level soils; however, some are for soils or miscellaneous areas that have a considerable range of slope, but have similar use and interpretations. A final number, 3 shows that the soil is severely eroded.

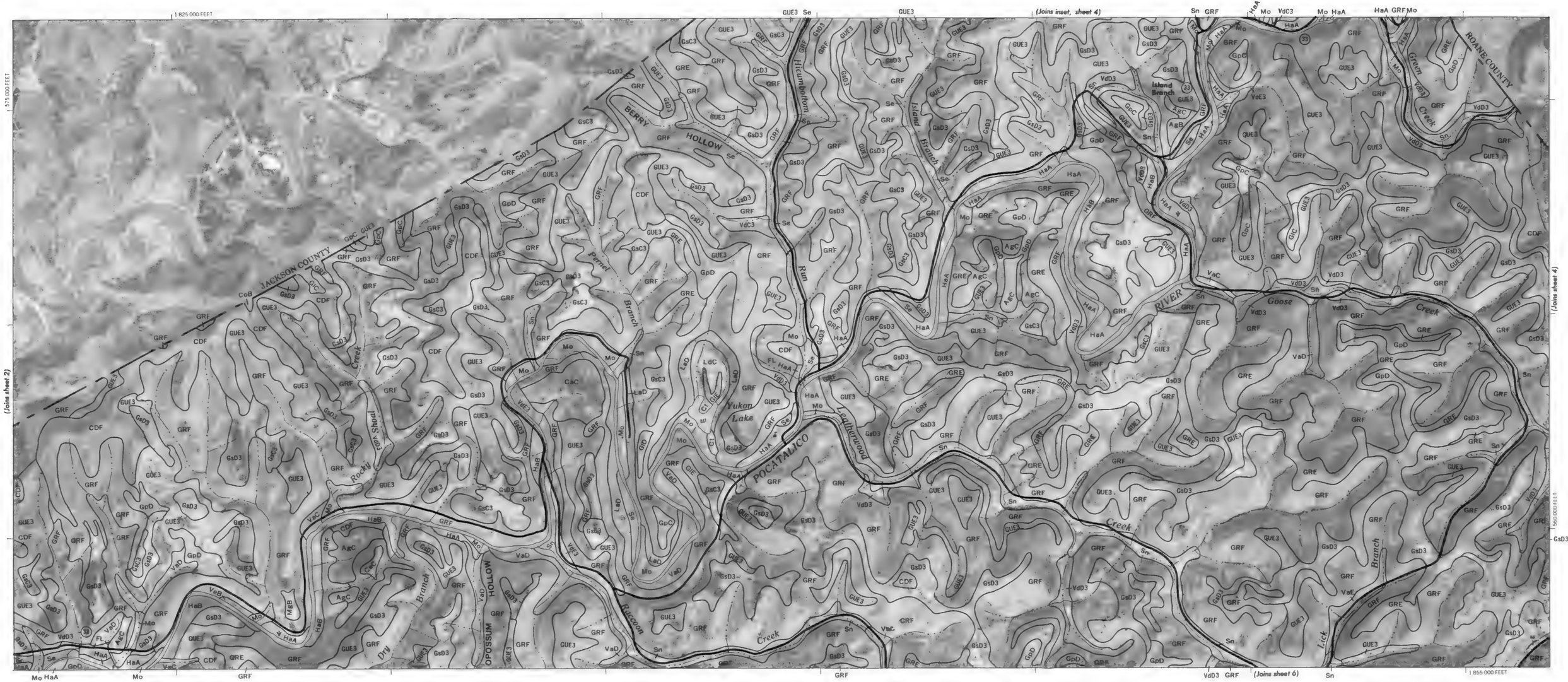
SYMBOL	NAME
AgB	Allegheny loam, shale substratum, 3 to 8 percent slopes
AgC	Allegheny loam, shale substratum, 8 to 15 percent slopes
CaC	Clymer loam, 10 to 20 percent slopes
CDD	Clymer-Dekalb complex, moderately steep
CDE	Clymer-Dekalb complex, steep
CDF	Clymer-Dekalb complex, very steep
CoB	Coolville silt loam, 3 to 10 percent slopes
CoC	Coolville silt loam, 10 to 20 percent slopes
CrC3	Coolville silty clay loam, 10 to 20 percent slopes, severely eroded
Ct	Cotaco loam
Dm	Dumps
FL	Fluvaquents
GIC	Gilpin silt loam, 10 to 20 percent slopes
GID	Gilpin silt loam, 20 to 30 percent slopes
GIE	Gilpin silt loam, 30 to 40 percent slopes
GpC	Gilpin-Upshur silt loams, 10 to 20 percent slopes
GpD	Gilpin-Upshur silt loams, 20 to 30 percent slopes
GRE	Gilpin-Upshur silt loams, steep
GRF	Gilpin-Upshur silt loams, very steep
GsC3	Gilpin-Upshur complex, 10 to 20 percent slopes, severely eroded
GsD3	Gilpin-Upshur complex, 20 to 30 percent slopes, severely eroded
GUE3	Gilpin-Upshur complex, steep, severely eroded
HaA	Hackers silt loam, 0 to 3 percent slopes
HaB	Hackers silt loam, 3 to 8 percent slopes
KaA	Kanawha fine sandy loam, 0 to 3 percent slopes
KaB	Kanawha fine sandy loam, 3 to 8 percent slopes
LaD	Laidig channery sandy loam, 15 to 25 percent slopes
LaE	Laidig channery sandy loam, 25 to 35 percent slopes
LdB	Laidig channery loam, 3 to 8 percent slopes
LdC	Laidig channery loam, 8 to 15 percent slopes
MgB	Monongahela silt loam, 3 to 8 percent slopes
MgC	Monongahela silt loam, 8 to 15 percent slopes
Mo	Moshannon silt loam
Qu	Quarries
Se	Senecaville silt loam
Sn	Sensabaugh silt loam
Ty	Tyler silt loam
UA	Udifluvents, gravelly
UB	Udifluvents, loamy
UC	Udorthents, smoothed-Urban land complex
UD	Udorthents, strip mine
Ue	Urban land
Uf	Urban land-Fluvaquents complex
Uk	Urban land-Kanawha complex
Ut	Urban land-Tyler complex
VaB	Vandalia silt loam, 3 to 8 percent slopes
VaC	Vandalia silt loam, 8 to 15 percent slopes
VaD	Vandalia silt loam, 15 to 25 percent slopes
VaE	Vandalia silt loam, 25 to 35 percent slopes
VdC3	Vandalia silty clay loam, 8 to 15 percent slopes, severely eroded
VdD3	Vandalia silty clay loam, 15 to 25 percent slopes, severely eroded
VdE3	Vandalia silty clay loam, 25 to 35 percent slopes, severely eroded
VeB	Vincent silt loam, 3 to 8 percent slopes
VeC	Vincent silt loam, 8 to 15 percent slopes
VnC3	Vincent silty clay loam, 8 to 15 percent slopes, severely eroded

KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 1

KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 2



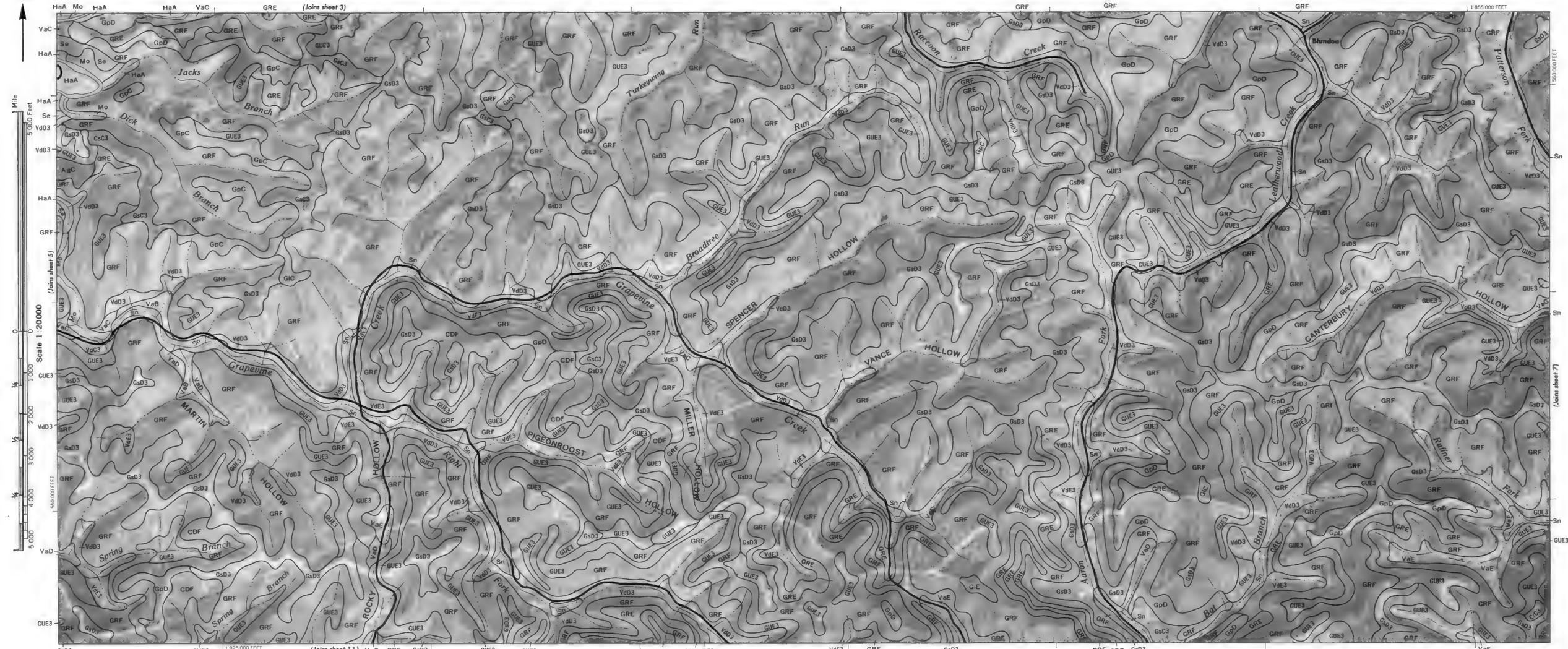
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 3




4
N
1 Mile
5 000 Feet
Scale 1:20000
0
0
1 000
¼
2 000
½
3 000
¾
4 000
5 000
1 890 000 FEET
1 850 000 FEET
575 000 FEET
585 000 FEET
580 000 FEET
565 000 FEET
1 860 000 FEET
1 840 000 FEET
(Joins sheet 3)
(Joins sheet 7)
ROANE COUNTY
JACKSON COUNTY
Hunt Fork
Camp Creek
Brush Creek
Allen Creek
GUNSTOCK KNOB
PAULEY HOL
GRF
GUE3
GsD3
GsC3
GRE
CDF
VaE
VaD
VdD3
VdC3
HaA
Mo
GpD
Sn

KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 5

KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 6



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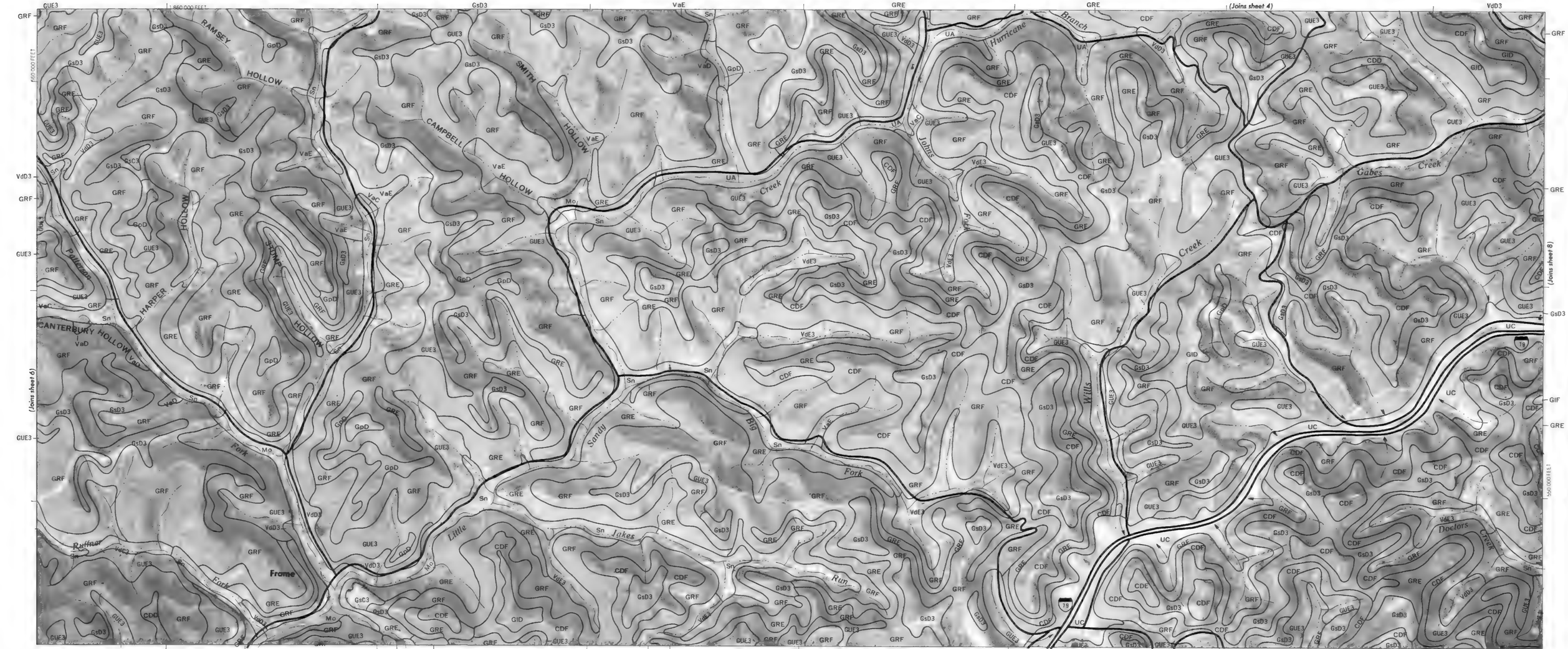
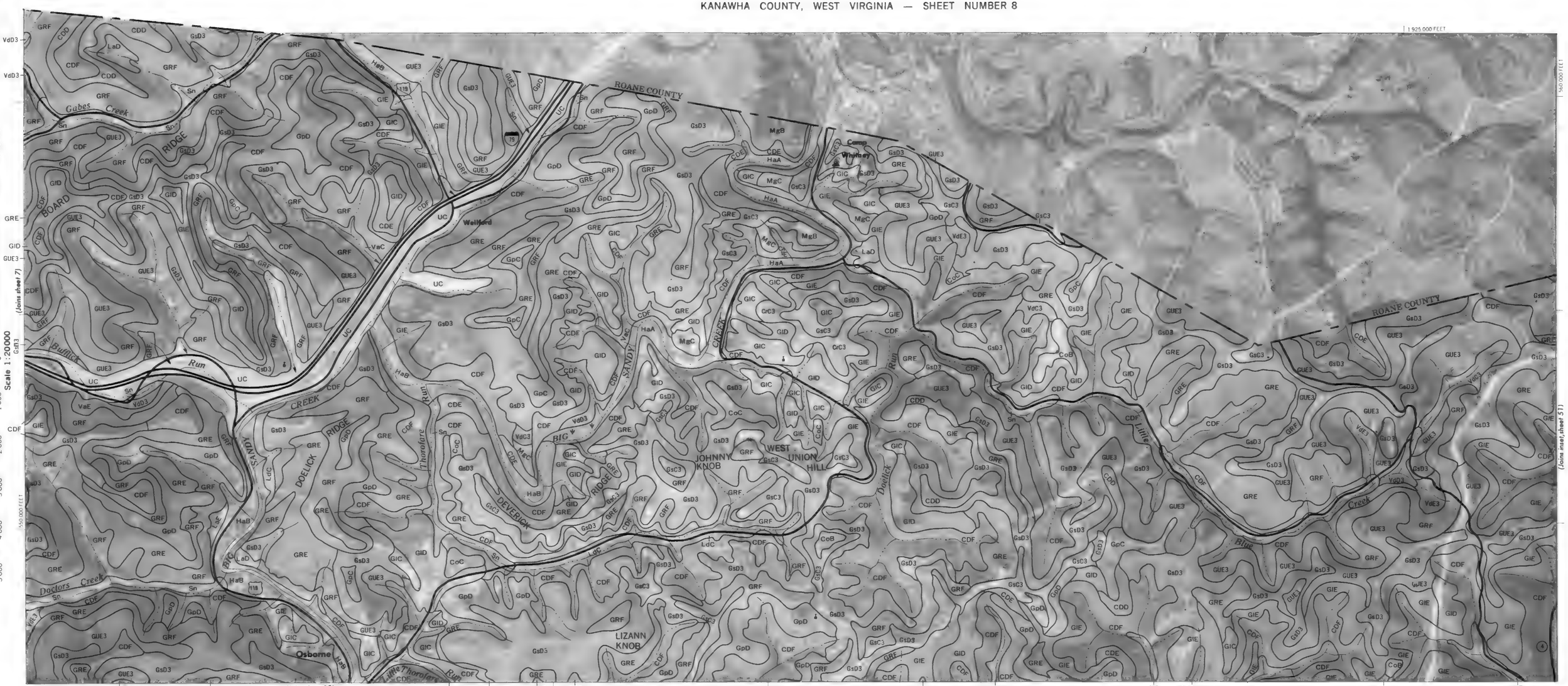
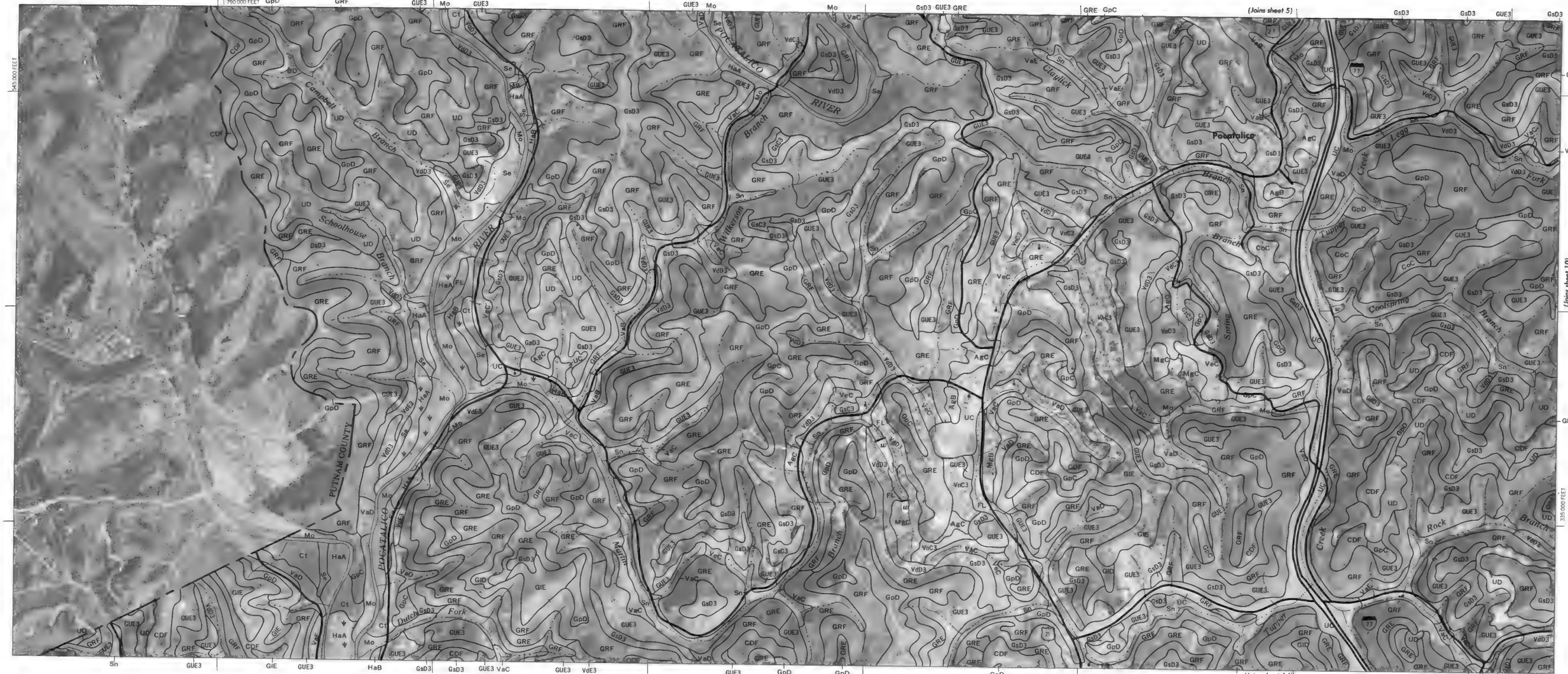
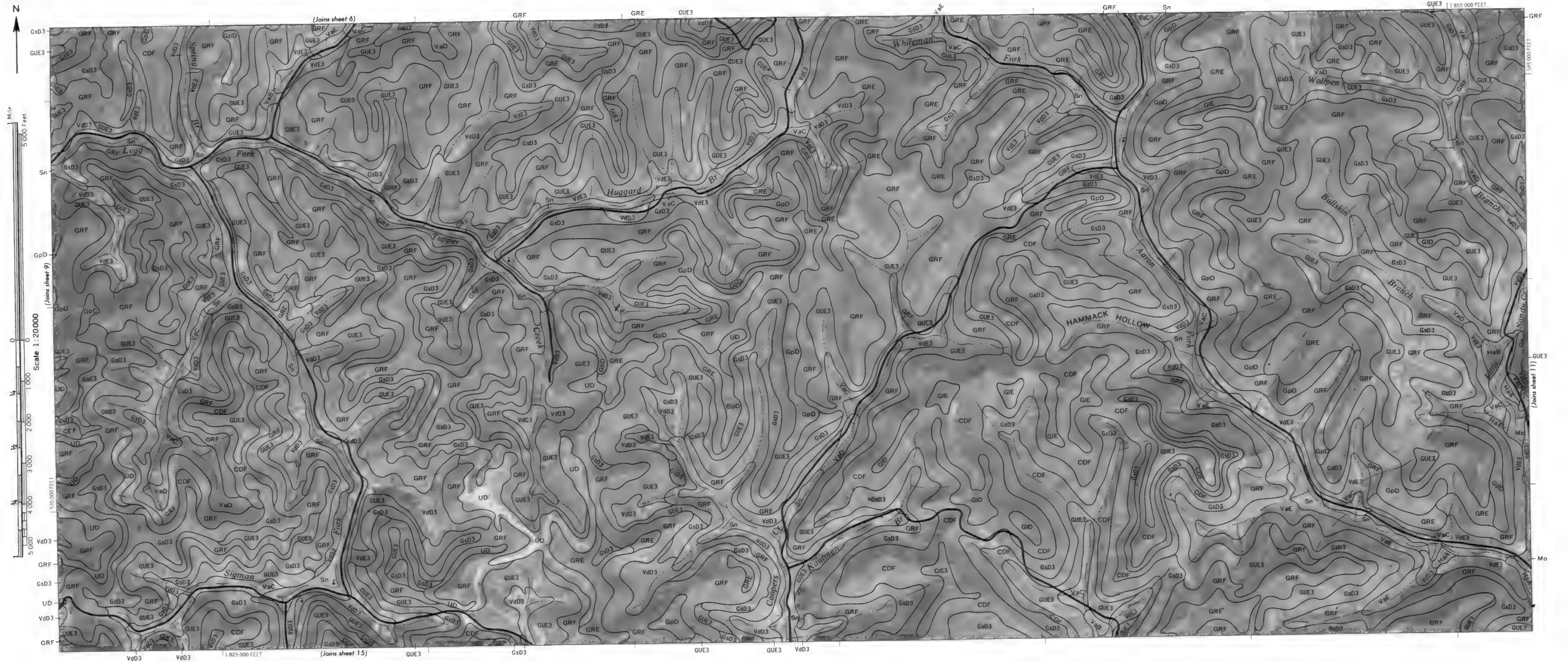


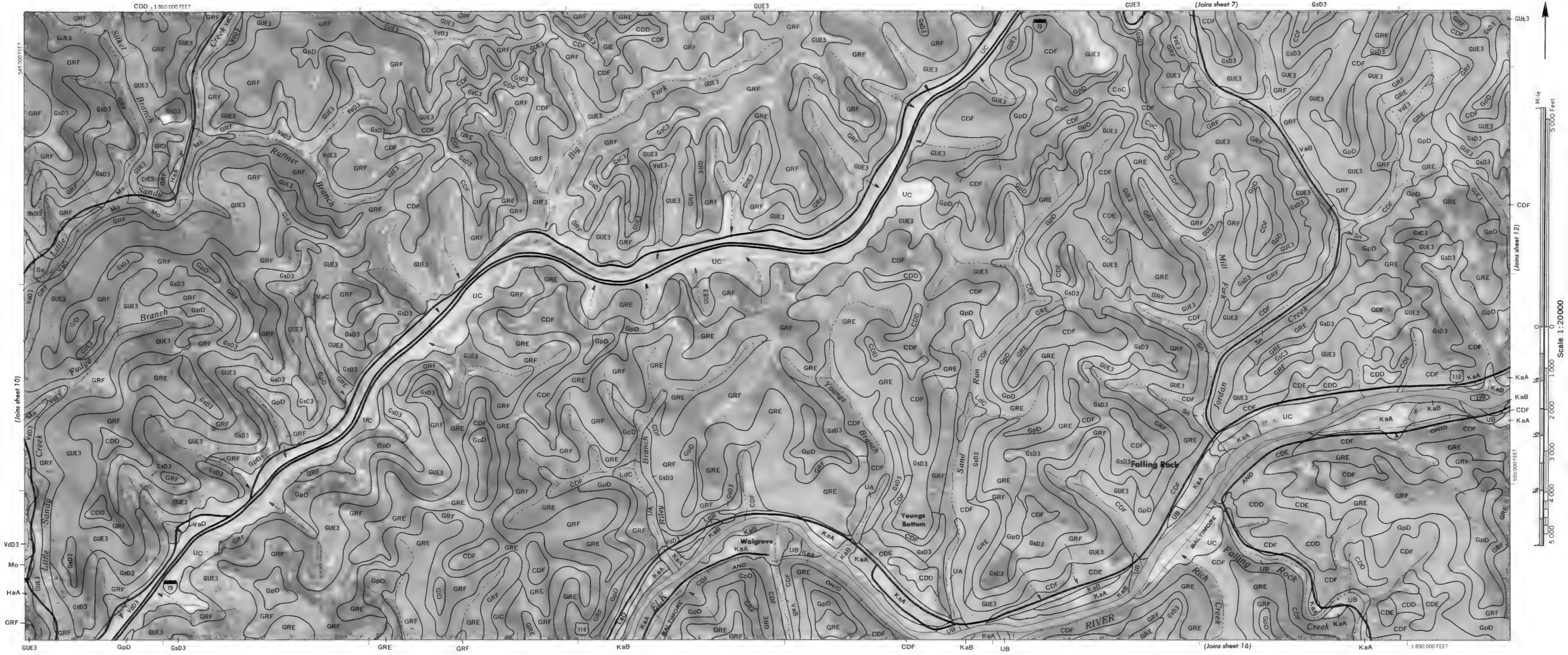

N
Scale 1:20000
1 Mile
5 000 Feet
1 000
2 000
3 000
4 000
5 000
1 925 000 FEET
560 000 FEET
1 895 000 FEET
560 000 FEET
(Joins sheet 7)
(Joins sheet 12)
(Joins inset, sheet 51)
ROANE COUNTY
ROANE COUNTY
Gabes Creek
RIDGE
BOARD
Wolford
Camp Whitney
Buffalo Run
CREEK
SANDY
Thorofare Run
BIG
DOELICK
RIDGE
DEVERICK
JOHNNY KNOB
WEST UNION HILL
CREEK
SANDY
RIDGE
Doctors Creek
Osborne
Little Thorofare Run
LIZANN KNOB
Doelick
Little
Blue
Creek

KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 9

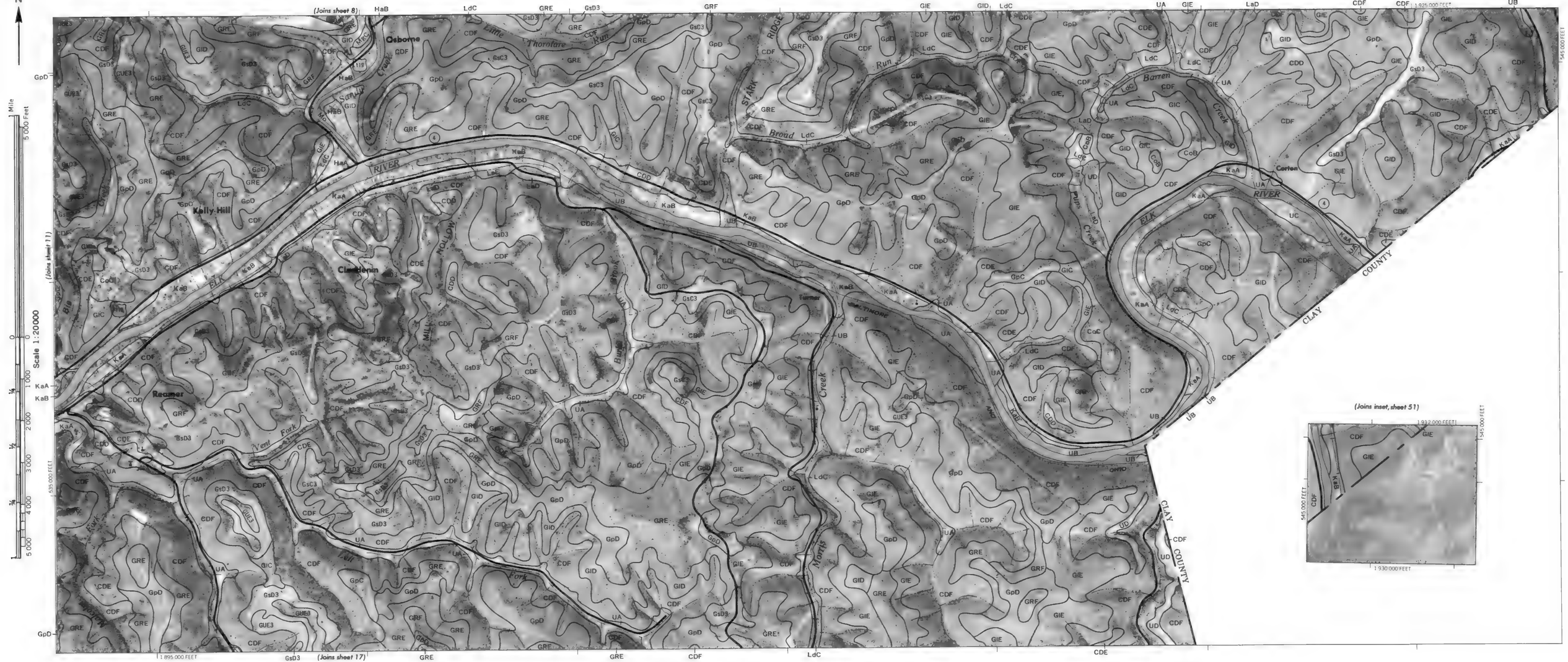


KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 10



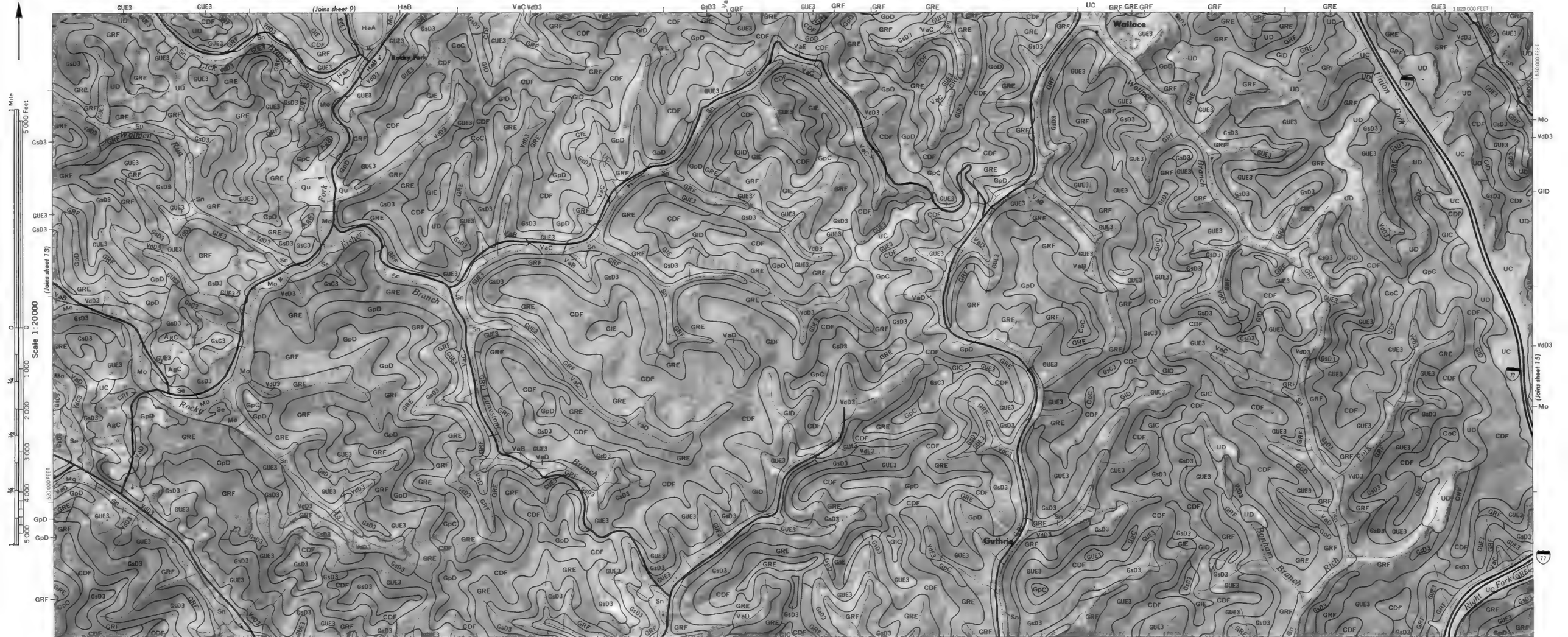

N
(Joins sheet 7)
(Joins sheet 10)
(Joins sheet 12)
(Joins sheet 16)
1 860 000 FEET
1 890 000 FEET
545 000 FEET
535 000 FEET
Scale 1:20000
1 Mile
5 000 Feet
Falling Rock
Walgrove
Youngs Bottom
ELK
RIVER
BALTIMORE AND OHIO
Big Fork
Ruffner Branch
Silket Branch
Sandy
Little Sandy Creek
Fudge Branch
Riley Branch
Youngs Branch
Sand Run
Mill Fork
Jordan Creek
Falling Rock Creek
Rich Creek
79
119

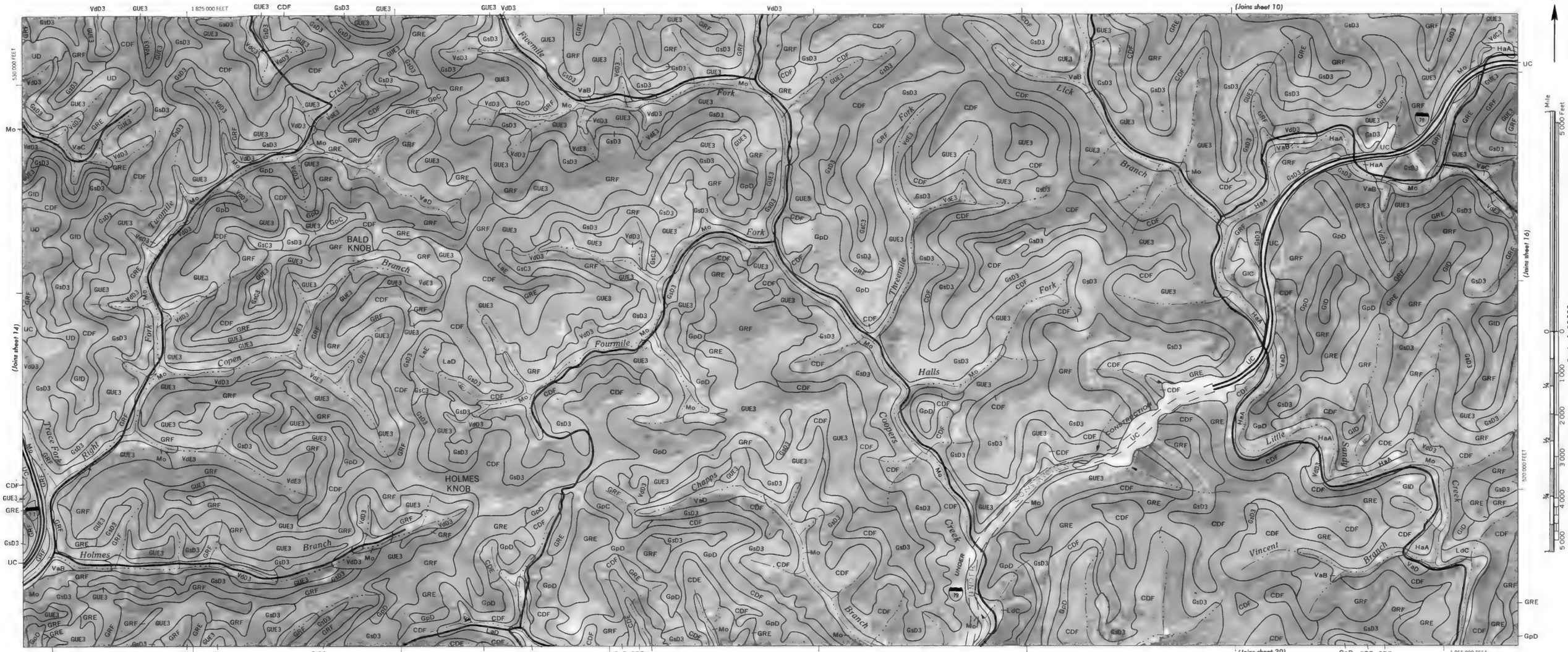
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 12



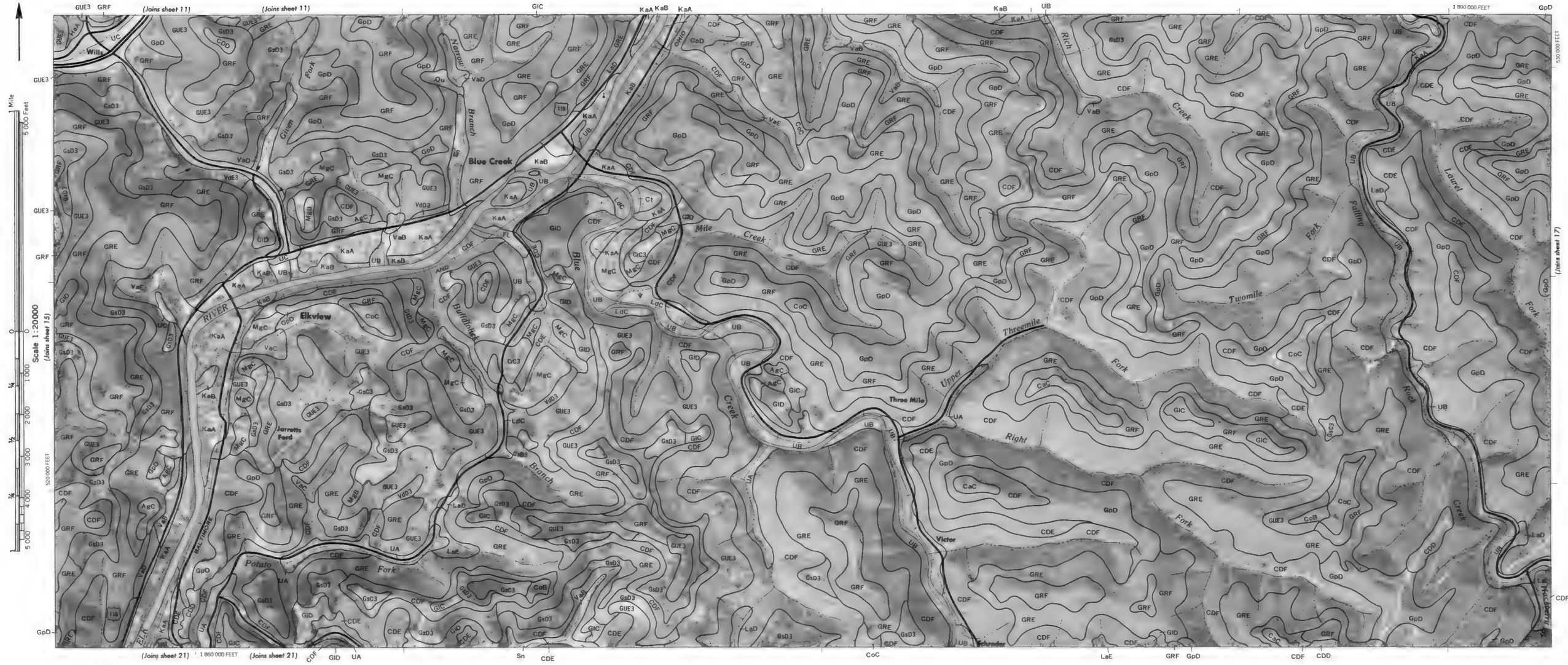

1 750 000 FEET
530 000 FEET
1 785 000 FEET
500 000 FEET
N
Scale 1:20000
Mile
5 000 Feet
PUTNAM COUNTY
KANAWHA RIVER
NITRO
CONRAIL
Armour
Creek
Branch
Bank
Clay
Rocky
Fork
CROSS LANES
Flatwoods
water
(Joins sheet 14)
(Joins sheet 10)

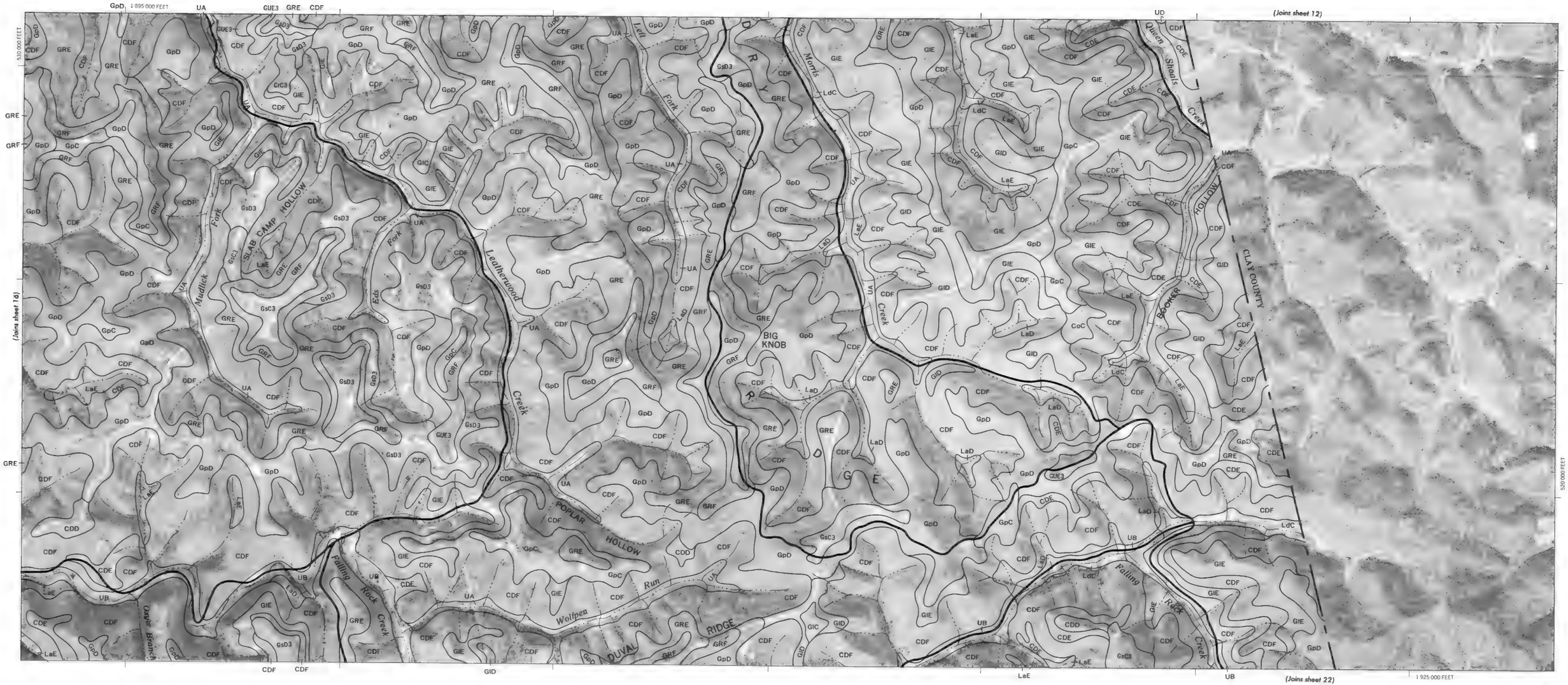
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 14



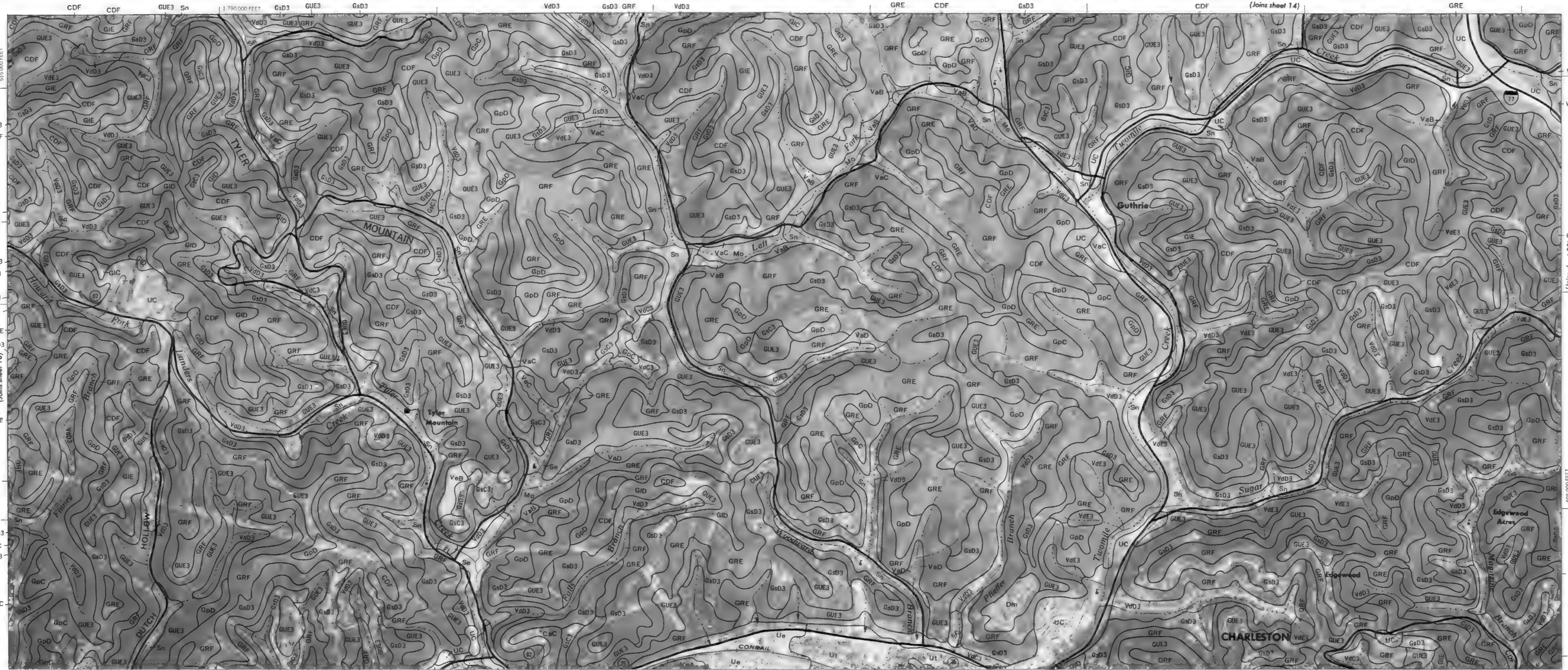

N
Scale 1:20000
1 Mile
5 000 Feet
0
1 000
2 000
3 000
4 000
5 000
1 825 000 FEET
1 855 000 FEET
530 000 FEET
500 000 FEET
(Joins sheet 10)
(Joins sheet 14)
(Joins sheet 16)
(Joins sheet 20)
BALD KNOB
HOLMES KNOB
Twomile Creek
Riverside
Fourmile
Threemile
Fork
Branch
Halls
Coopers
Chapps
Holmes
Copen
Trace Fork
Right
Lick
Little
Sampson
Creek
Vincent
CONSTRUCTION
UNDER
UC
Mo
GRE
GRF
GpD
GsD3
CDF
GUE3
VdD3
HaA
VaB
GID
LdC

KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 16



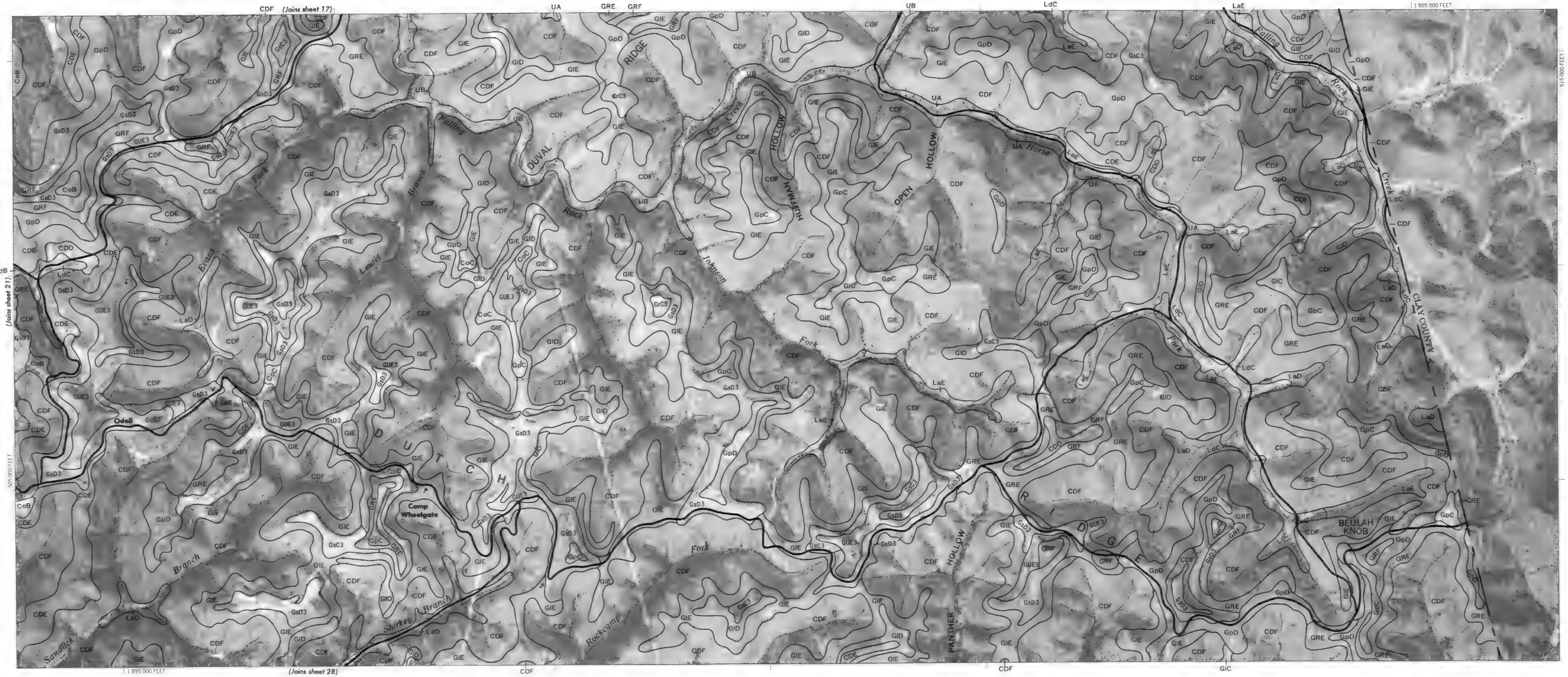

1 895 000 FEET
1 925 000 FEET
530 000 FEET
520 000 FEET
(Joins sheet 16)
(Joins sheet 12)
(Joins sheet 22)
N
Scale 1:20000
1 Mile
5 000 Feet
Left Fork Mortis Creek
Queen Shoals Creek
Leatherwood Creek
Madlick Fork
SLAB CAMP HOLLOW
Eds Fork
BOOKER HOLLOW
CLAY COUNTY
BIG KNOB RIDGE
POPLAR HOLLOW
Falling Rock Creek
Wolfpen Run
DUVAL RIDGE
Otter Branch

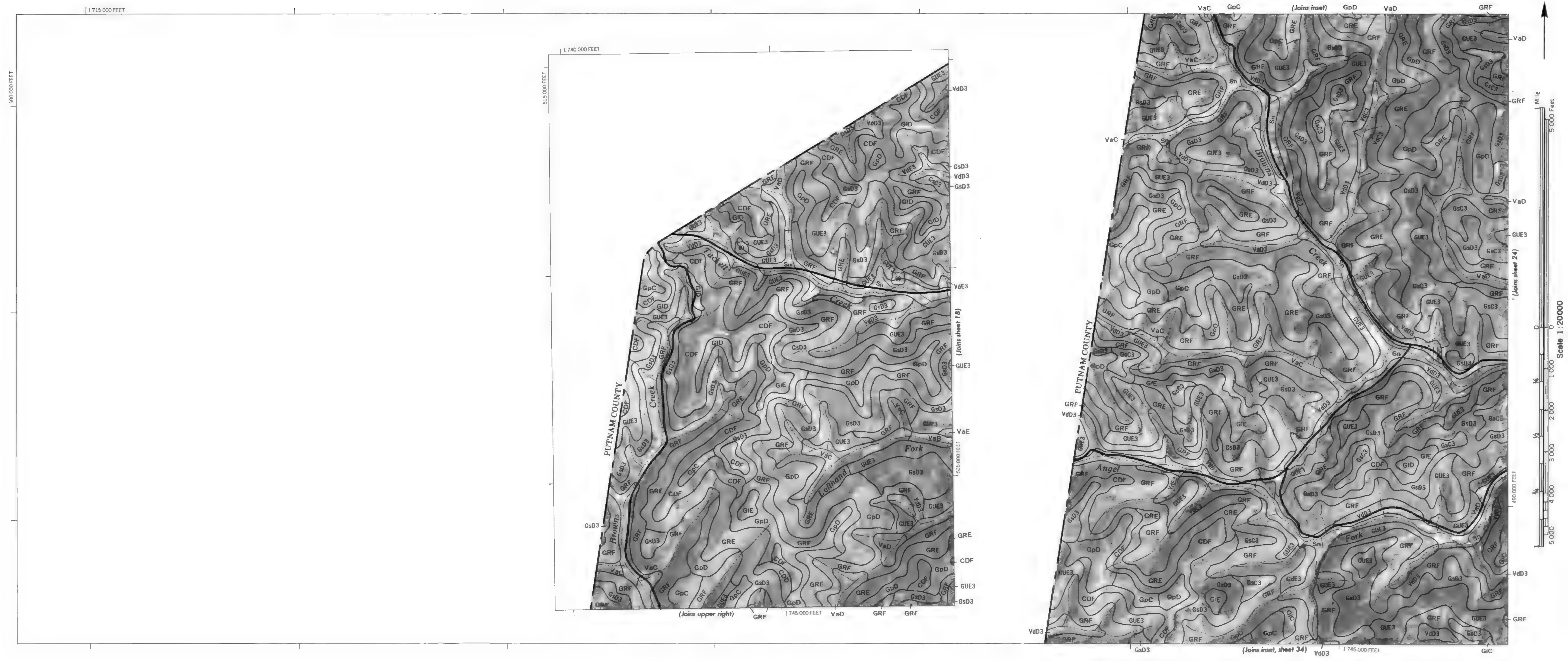
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 18


N
Scale 1:20000
1 Mile
5,000 Feet
(Joins sheet 14)
(Joins sheet 18)
(Joins sheet 20)
(Joins sheet 25)
1 790 000 FEET
1 820 000 FEET
515 000 FEET
505 000 FEET
Guthrie
Tyler Mountain
CHARLESTON
Edgewood
Edgewood Acres
TYLER MOUNTAIN
DUTCH HOLLOW
Tyler Mountain Creek
Harpers Branch
Pinney Branch
Left Fork Twomile Creek
Twomile Creek
Sugar Creek
Woodward Branch
Pfeffer Branch
Brunch Branch
CONRAIL

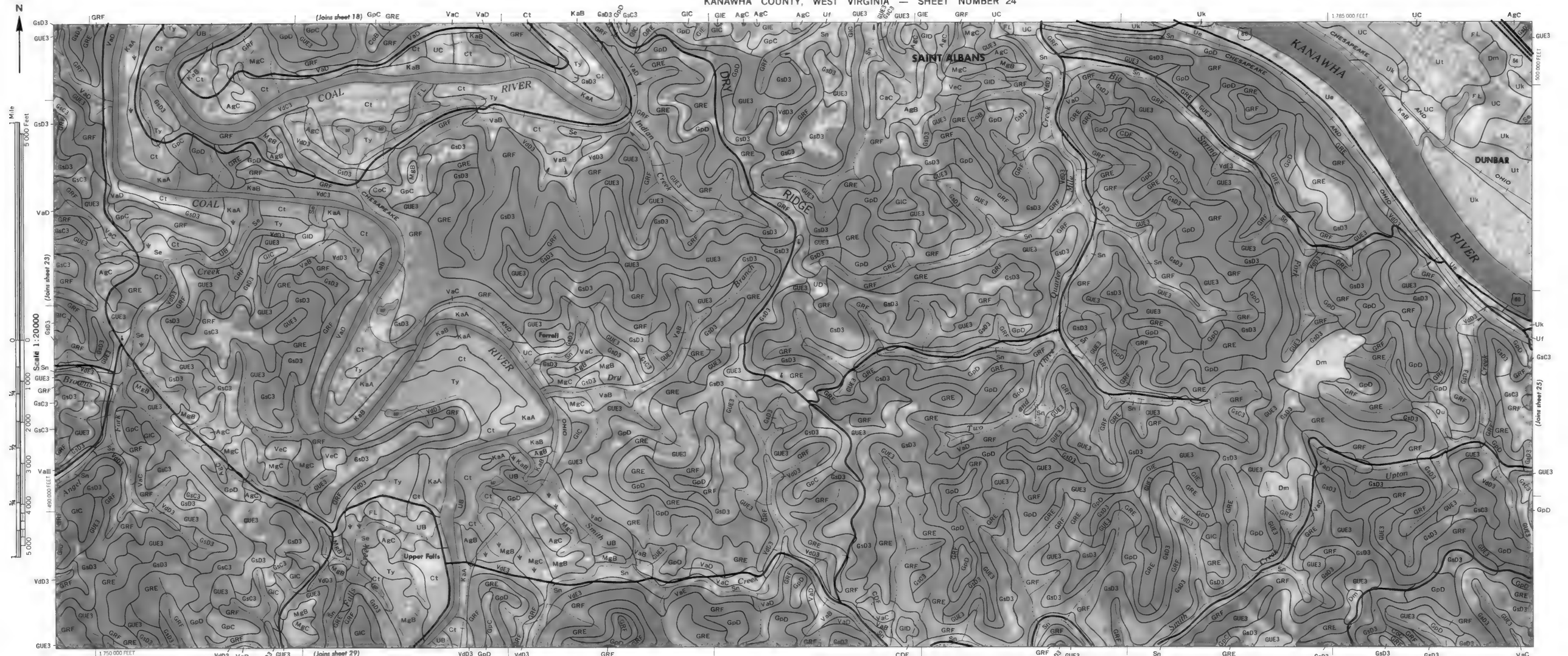
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 20


N
1 850 000 FEET
1 890 000 FEET
515 000 FEET
505 000 FEET
(Joins sheet 16)
(Joins sheet 20)
(Joins sheet 22)
(Joins sheet 27)
Scale 1:20000
1 Mile
5 000 Feet
Pinch
Creek
Flatwood
Run
Turkey
Fork
Indian
MILE
HOLLOW
PINCH
RIDGE
Threemile
Lower
Billy
Branch
Elkhorn
Coon
Creek
HICKORY
KNOB
CREEK
Laurel
Fork
Hackberry
BLUE
CREEK
Wertz
Chapel
Schrader
BALTIMORE
AND
OHIO
RIVER


22
N
Scale 1:20000
1 Mile
5 000 Feet
(Joins sheet 17)
(Joins sheet 21)
(Joins sheet 28)
1 925 000 FEET
1 895 000 FEET
515 000 FEET
Odell
Camp Wheelgate
DUTCH
RIDGE
DUVAL
HOLLOW
HUFFMAN
OPEN
Horse
Creek
Rock
Falling
Fork
Branch
Laurel
Evans
Johnson
Rockcamp
Shirkey
Sandlick
PANTHER
RIDGE
BEULAH KNOB
CLAY COUNTY
CDF
GpD
GpC
GsD3
GsC3
GUE3
GRE
GRF
GIE
GID
LaD
LaE
LdC
LdB
CoB
CoC
CoD
CrC3
UA
UB

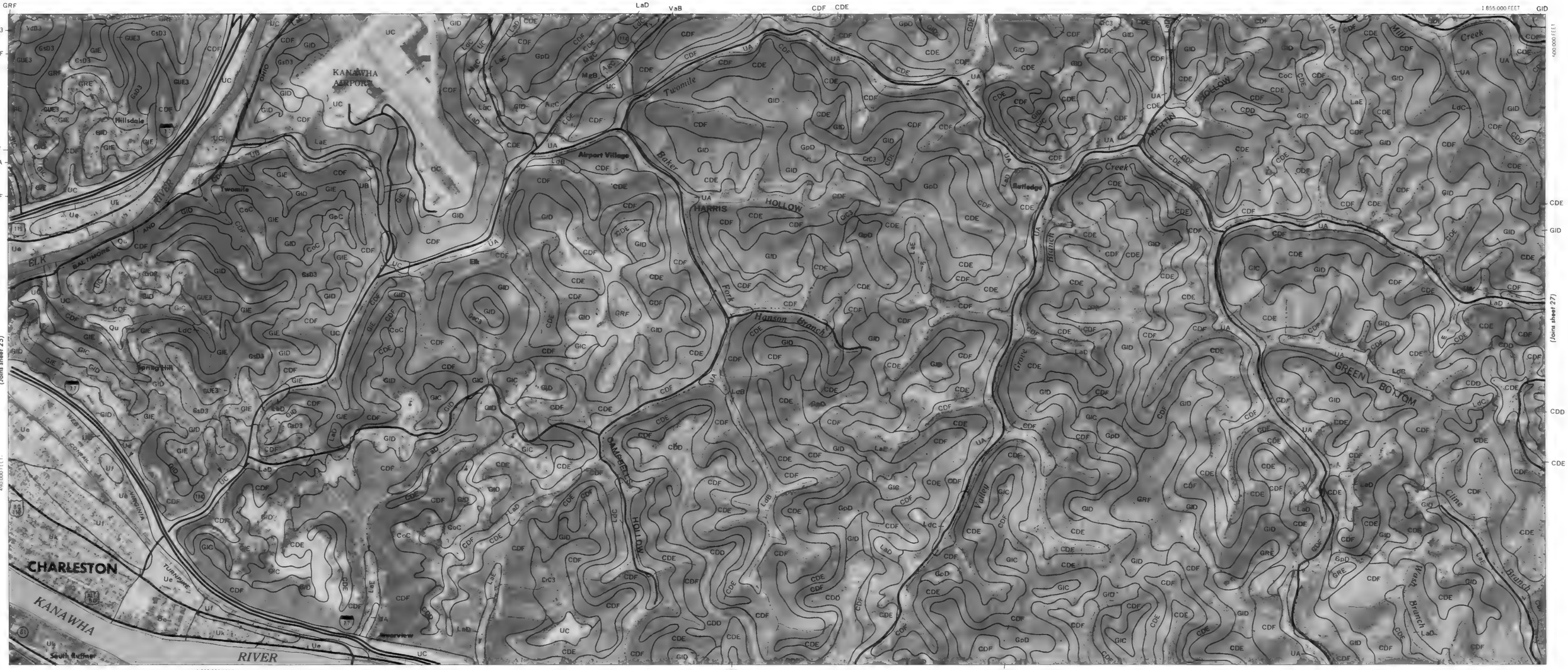

N
1 715 000 FEET
500 000 FEET
1 740 000 FEET
515 000 FEET
1 745 000 FEET
505 000 FEET
490 000 FEET
PUTNAM COUNTY
Browns Creek
Tackett Creek
Lefthand Fork
Angel Fork
(Joins upper right)
(Joins sheet 18)
(Joins inset)
(Joins sheet 24)
(Joins inset, sheet 34)
Scale 1:20000
Mile
Feet

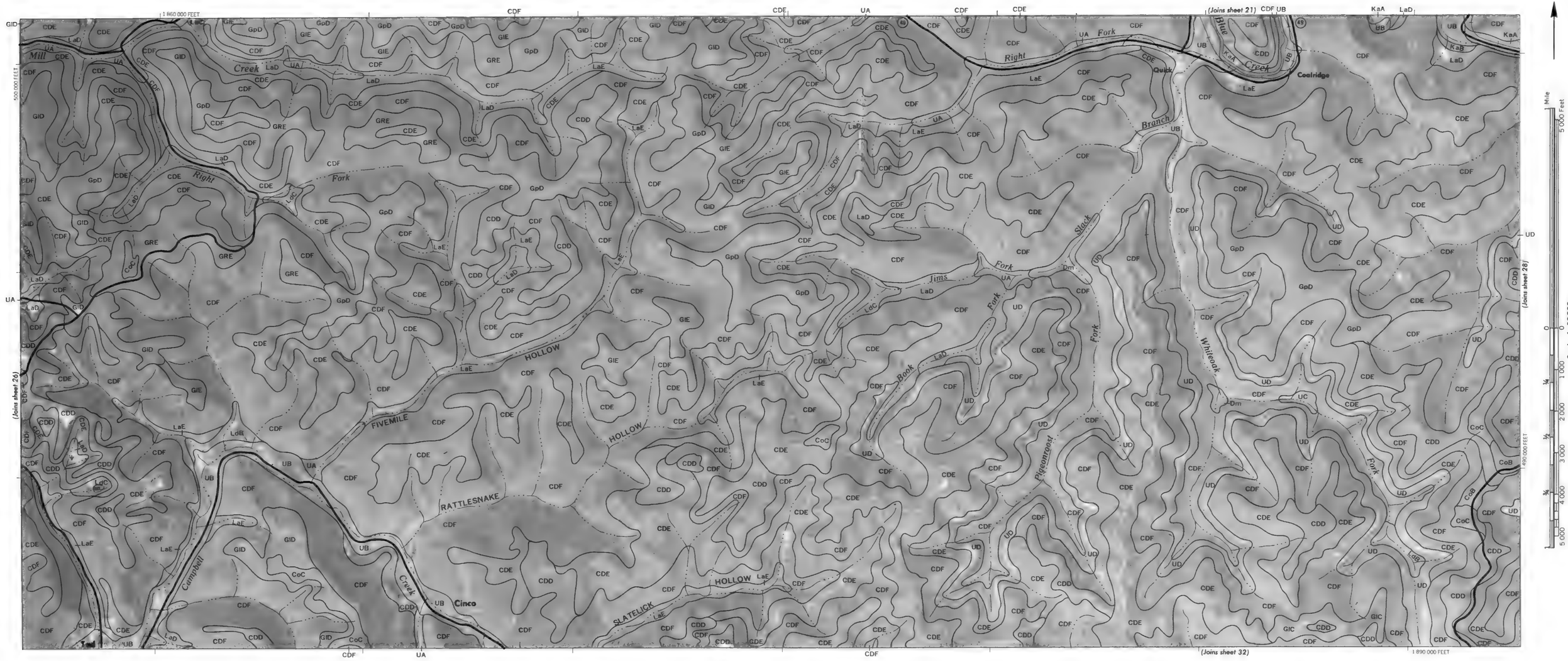
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 24




(Joins sheet 19)
(Joins sheet 24)
(Joins sheet 26)
(Joins sheet 30)
1 785 000 FEET
500 000 FEET
490 000 FEET
1 820 000 FEET
N
Scale 1:20000
Mile
Feet
KANAWHA
RIVER
ELK RIVER
BLAINE ISLAND
WILSON ISLAND
DUNBAR
SOUTH CHARLESTON
CHARLESTON
North Charleston
West Side
East Side
Spring Hill
Rock Lake Village
Forest Hill
Vandalia
Fort Hill
Weberwood
Joplin
Oakwood
South Hills
Davis Creek
DUTCH HOLLOW
WARD HOLLOW
Aarons Creek
Two Mile Creek
Magazine Branch
Joplin Branch
Ferry Branch
Davis Creek
Sugarcamp Creek
Trace Fork
Dry Branch
CONRAIL
CHESAPEAKE AND OHIO
water

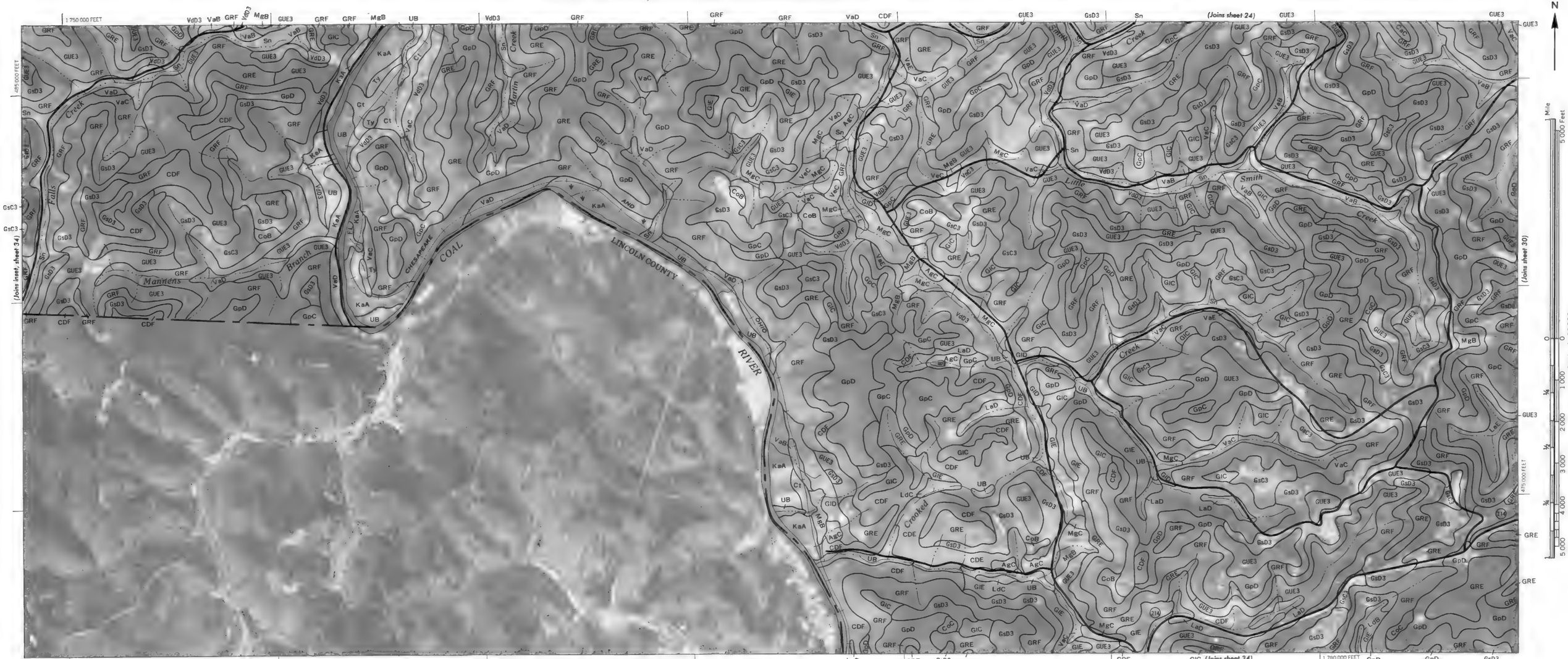
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 26



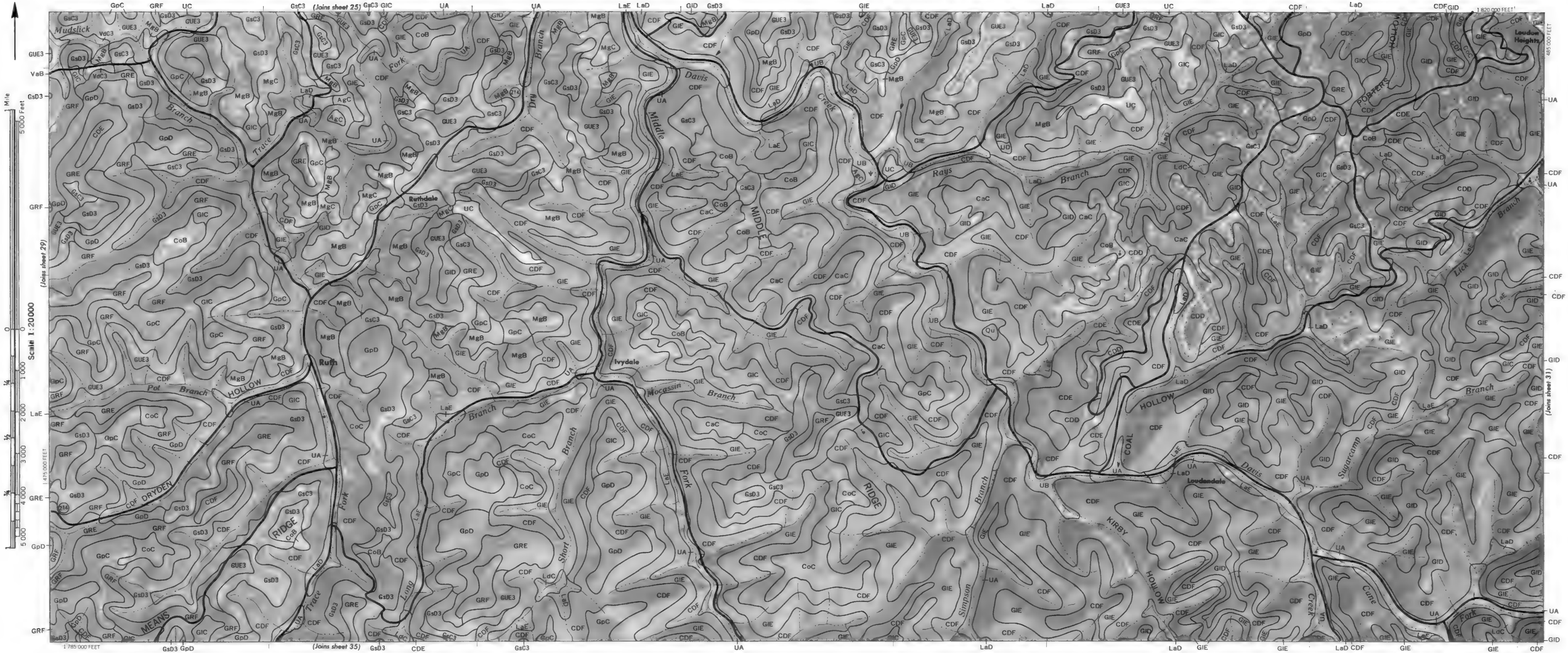

1 860 000 FEET
500 000 FEET
Mill Creek
Right Fork
Blue Creek
Quick Branch
Coalridge
Jims Fork
Slack Fork
Book Fork
Whiteoak Fork
Piggomtoost Fork
HOLLOW
FIVEMILE
RATTLESNAKE
SLATELICK
Campbell Creek
Cinco
(Joins sheet 21)
(Joins sheet 26)
(Joins sheet 28)
(Joins sheet 32)
1 890 000 FEET
490 000 FEET
N
Mile
5 000 Feet
Scale 1:20000

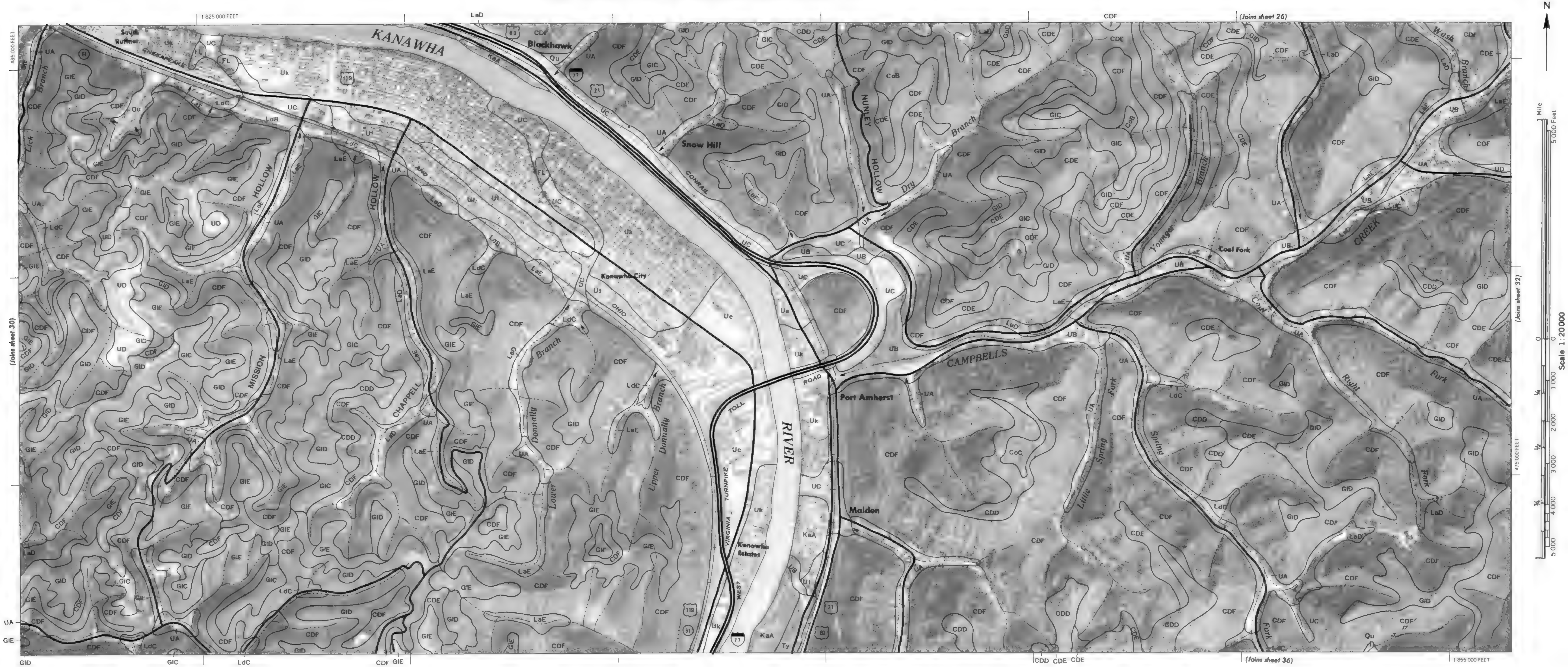
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 28

KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 29

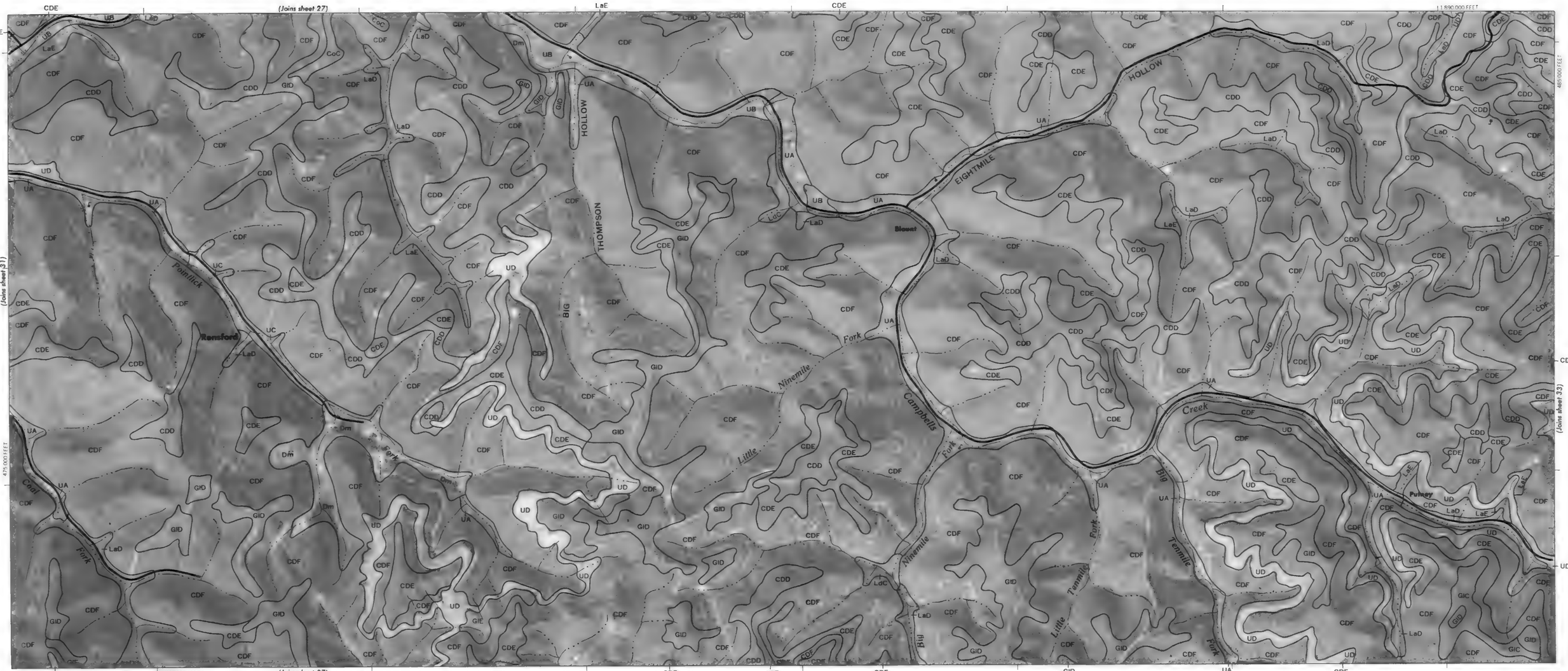


KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 30

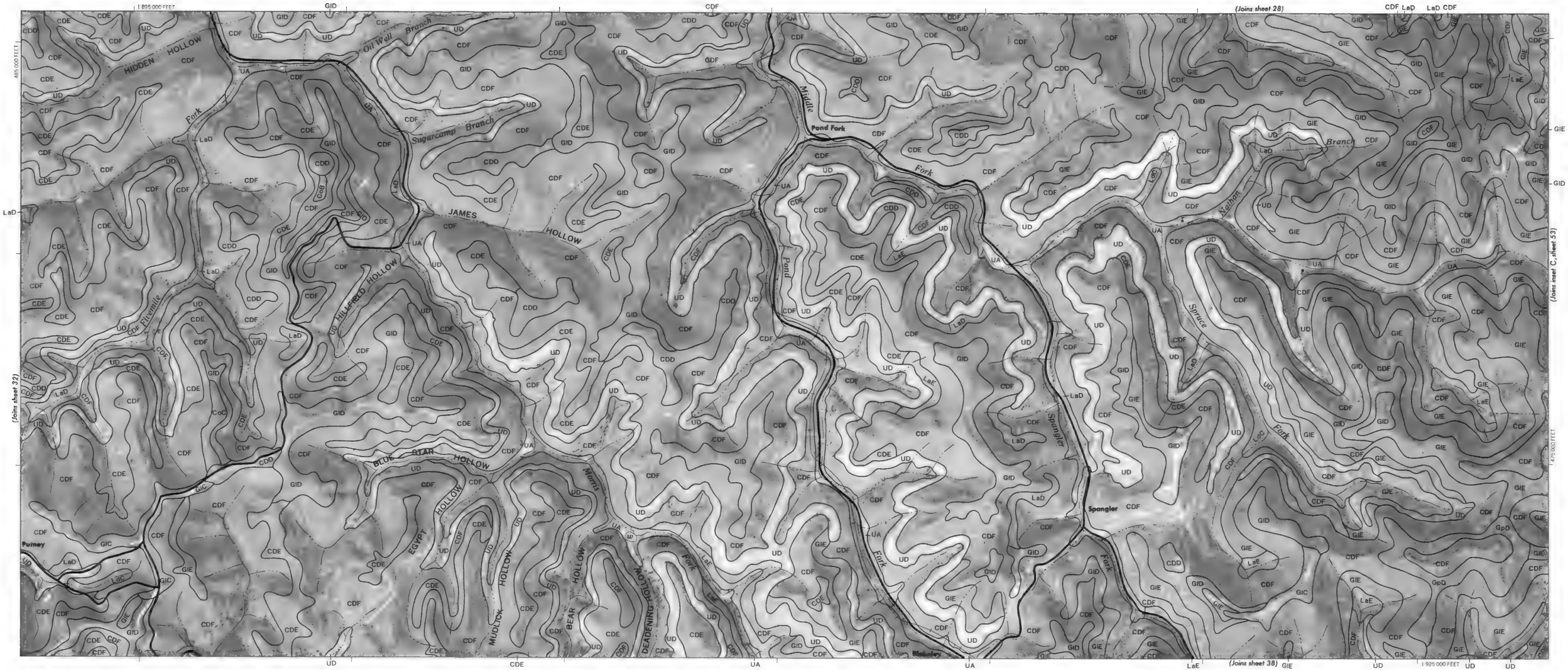



(Joins sheet 26)
(Joins sheet 30)
(Joins sheet 32)
(Joins sheet 36)
1 825 000 FEET
1 855 000 FEET
485 000 FEET
475 000 FEET
N
Scale 1:20000
Mile
Feet
KANAWHA
RIVER
South Ruffner
Blackhawk
Snow Hill
Kanawha City
Port Amherst
Malden
Kanawha Estates
Coal Fork
CAMPBELLS
CREEK
CONRAIL
CHESAPEAKE AND OHIO
ROAD
WEST VIRGINIA TURNPIKE TOLL
NUNLEY HOLLOW
MISSION HOLLOW
CHAPPELL HOLLOW
Lick Branch
Dry Branch
Younger Branch
Wash Branch
Lower Donnally Branch
Upper Donnally Branch
Little Spring Fork
Spring Fork
Right Fork
Coal Fork

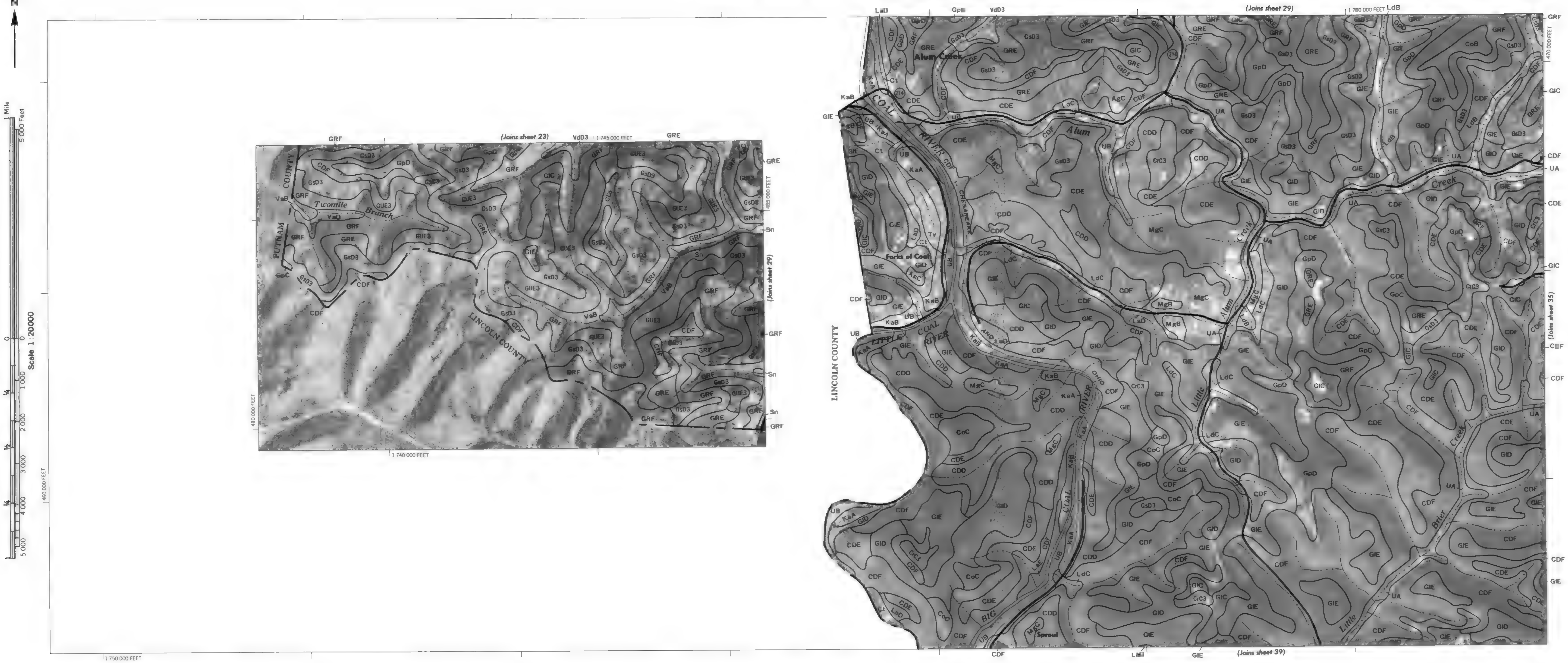
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 32

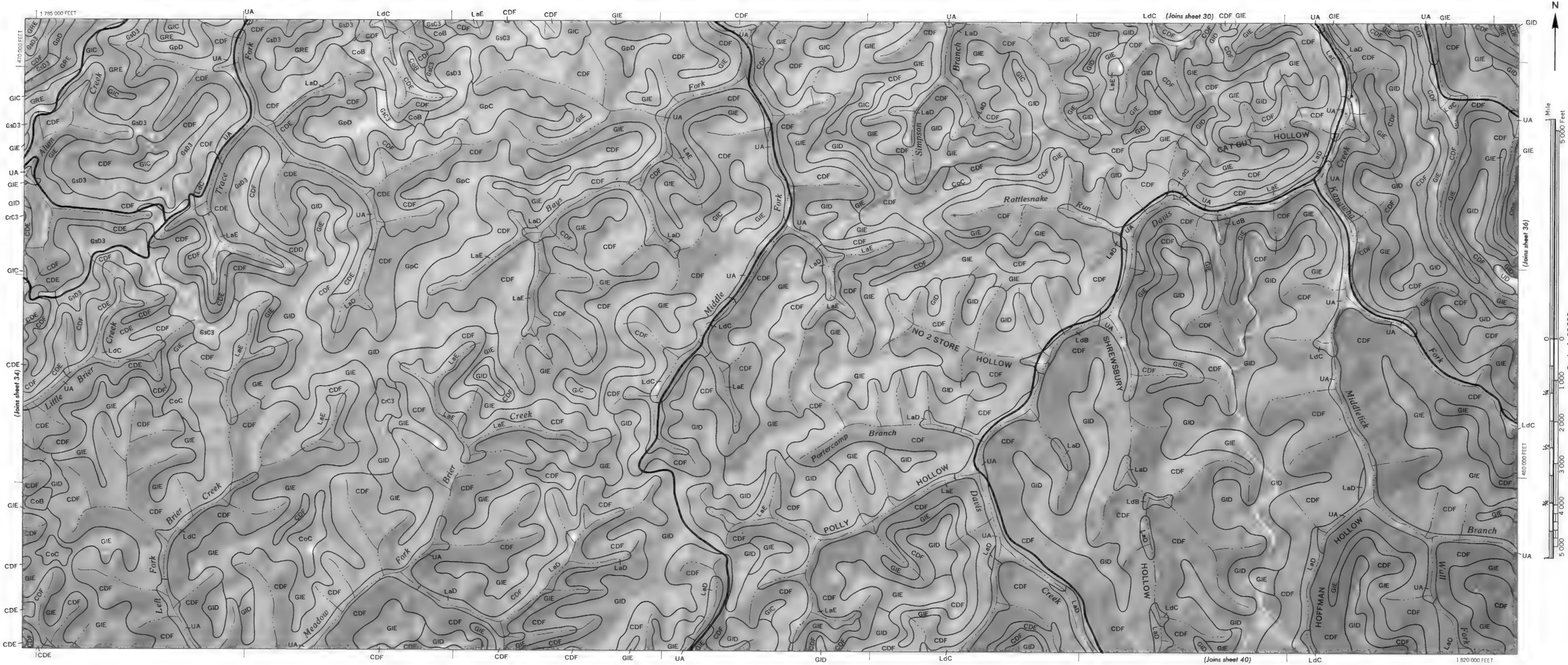


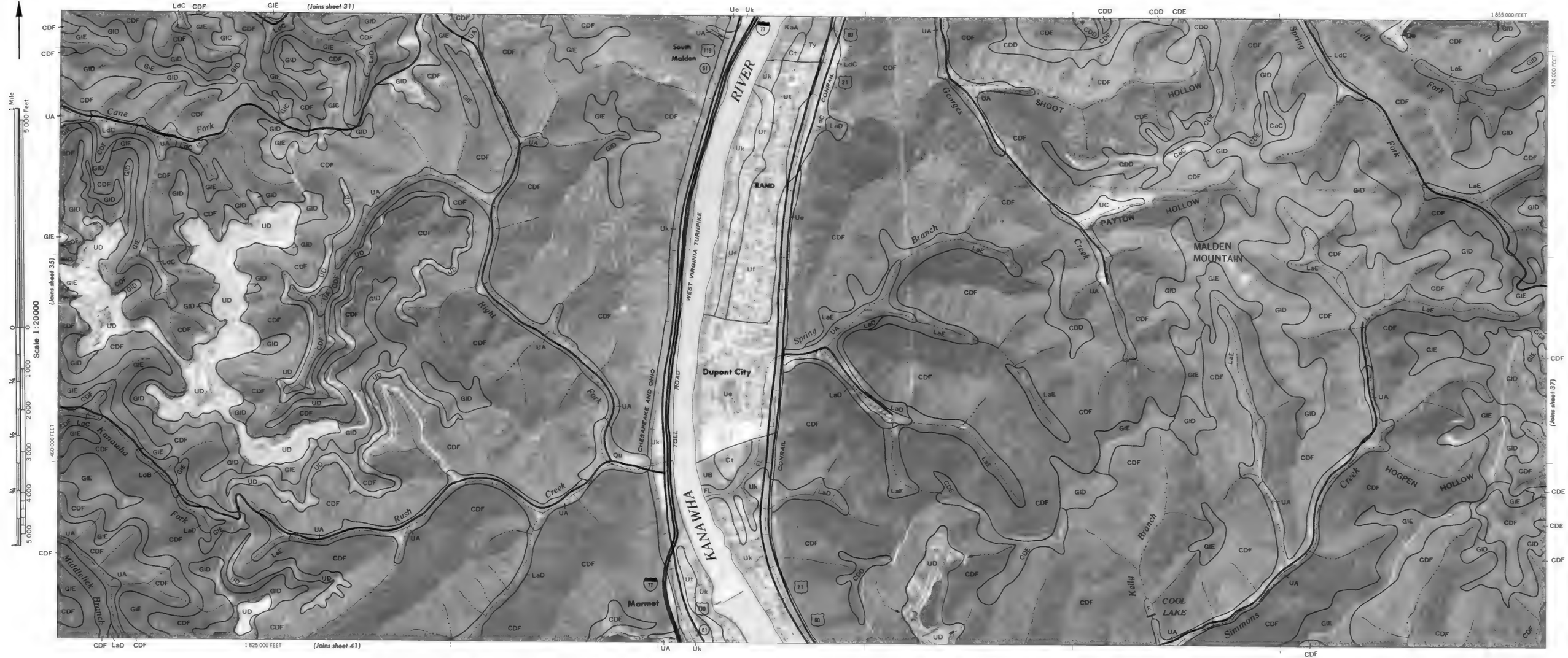
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 33



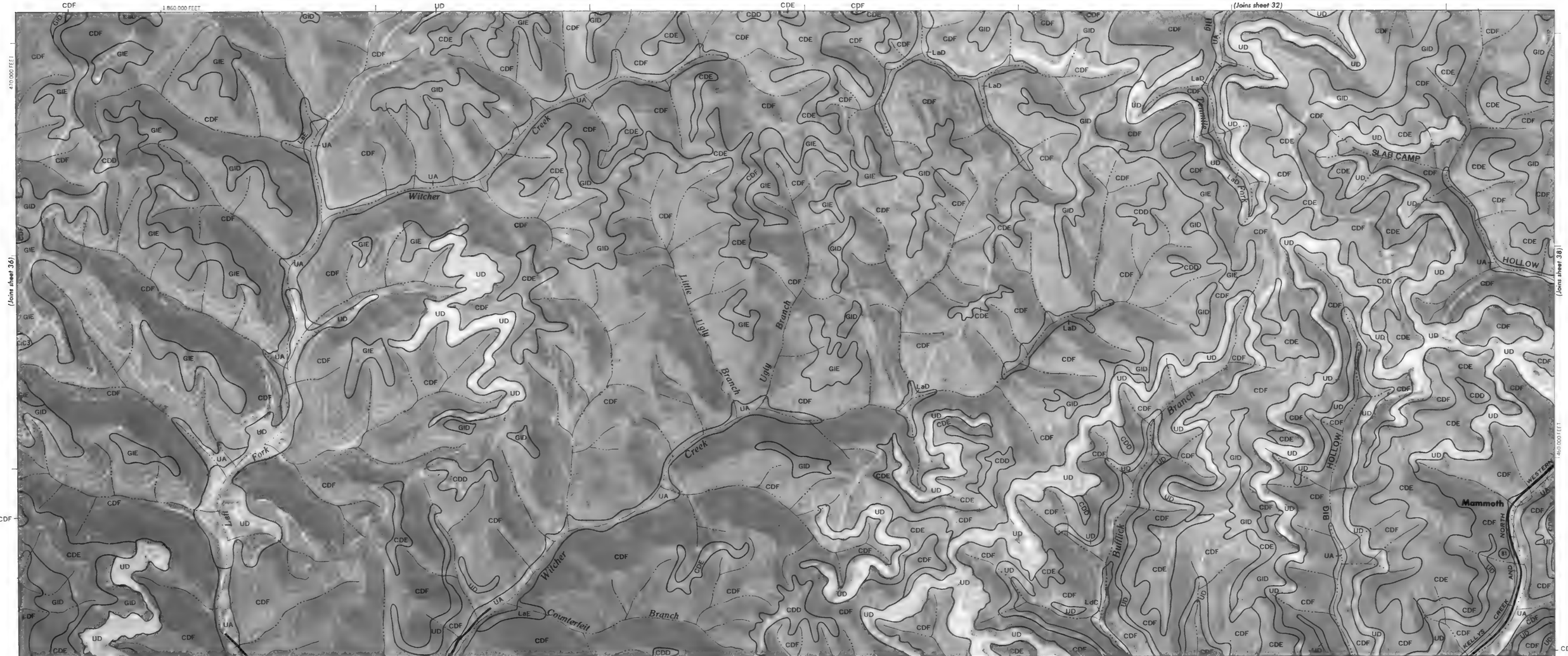
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 34




1 785 000 FEET
470 000 FEET
N
Scale 1:20000
Mile
5 000 Feet
(Joins sheet 34)
(Joins sheet 36)
(Joins sheet 30)
(Joins sheet 40)
1 820 000 FEET
460 000 FEET
Alum Creek
Little Trace Fork
Brier Creek
Brier Fork
Left Fork Meadow Creek
Middle Fork Beas Creek
Middle Fork
Simpson Branch
Rattlesnake Run
Davis Kanawha
Portercamp Branch
POLLY HOLLOW
NO 2 STORE HOLLOW
SHREWSBURY HOLLOW
CAT GUT HOLLOW
Middlelick Fork
HOFFMAN HOLLOW
Wall Branch
Davis Creek
UA
LdC
LaE
CDF
GIE
GID
GIC
GRE
GpD
GsD3
GsC3
CoB
GpC
LaD
CoC
CrC3
LdB
CDE


N
Scale 1:20000
1 Mile
5 000 Feet
(Joins sheet 35)
(Joins sheet 41)
(Joins sheet 37)
1 825 000 FEET
1 855 000 FEET
460 000 FEET
470 000 FEET
Cane Fork
Kanawha
Rush Creek
Muddlelick Branch
Right Fork
Left Fork
Spring Branch
Georges Creek
SHOOT HOLLOW
PAYTON HOLLOW
HOGPEN HOLLOW
MALDEN MOUNTAIN
Kelly Branch
COOL LAKE
Simmons
KANAWHA RIVER
WEST VIRGINIA TURNPIKE
CHESAPEAKE AND OHIO TOLL ROAD
CONRAIL
South Malden
Dupont City
Marmet
BAND

KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 37



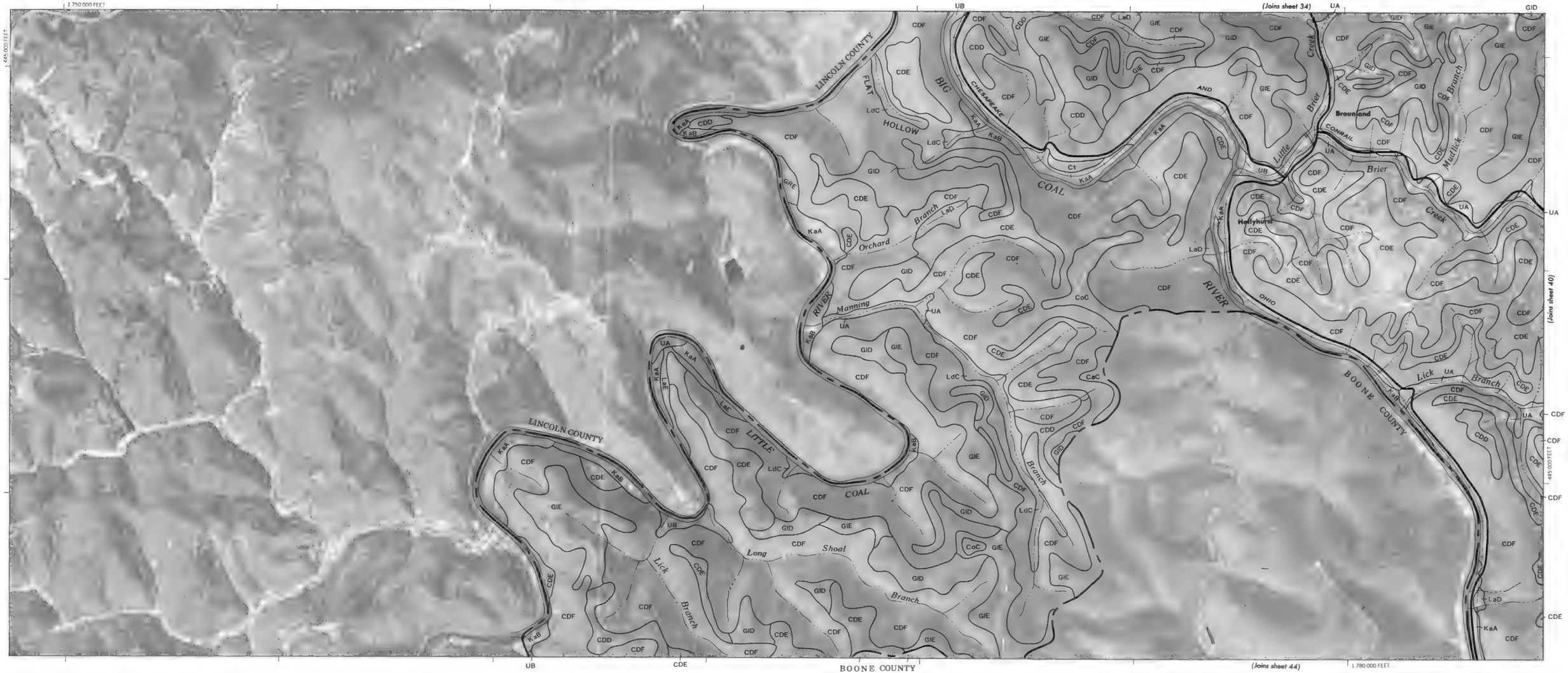
N

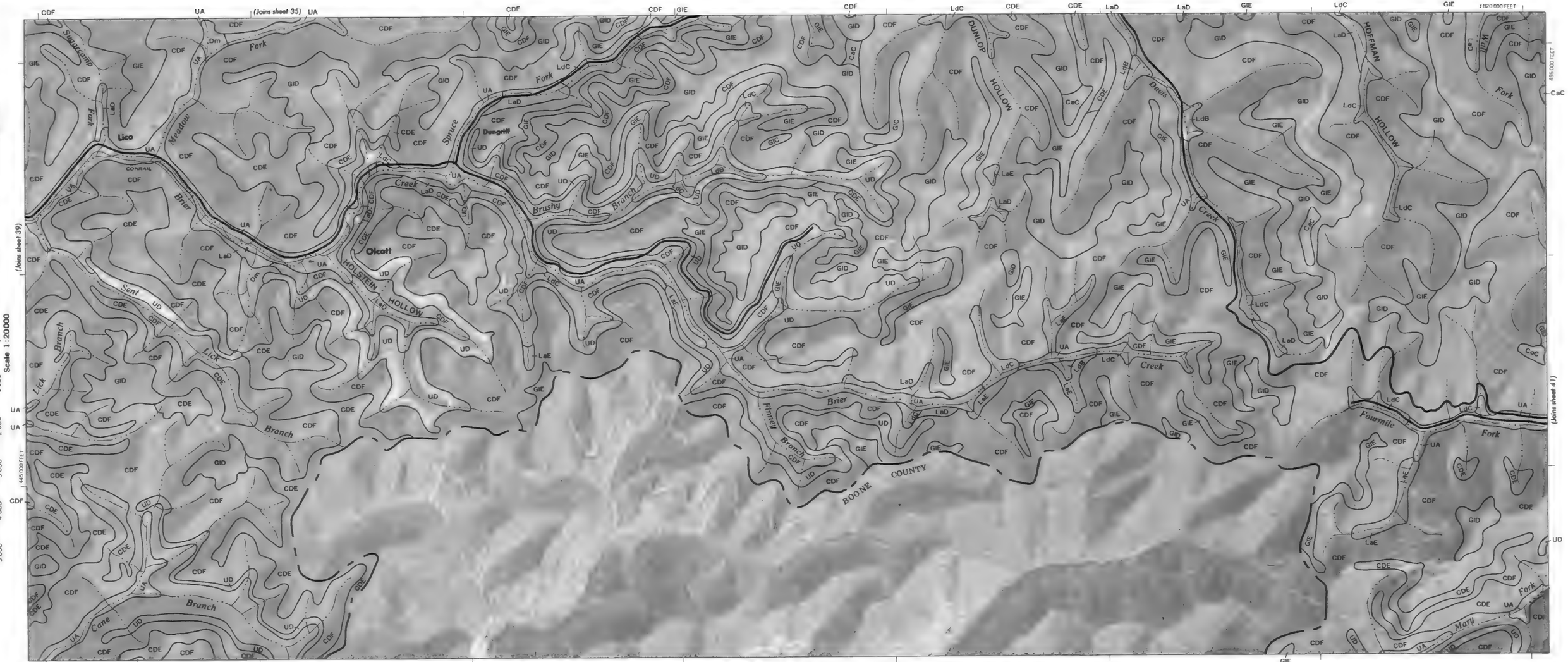
Mile

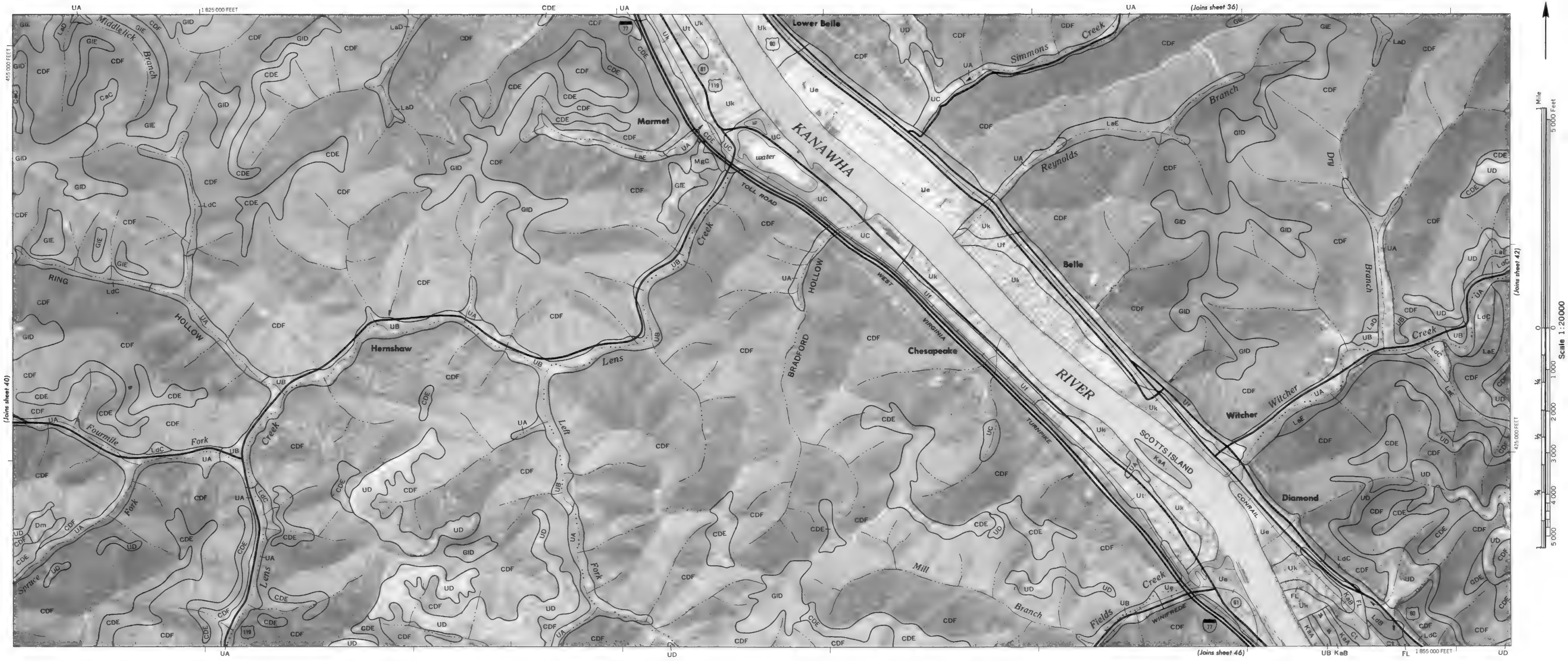
Scale 1:20000

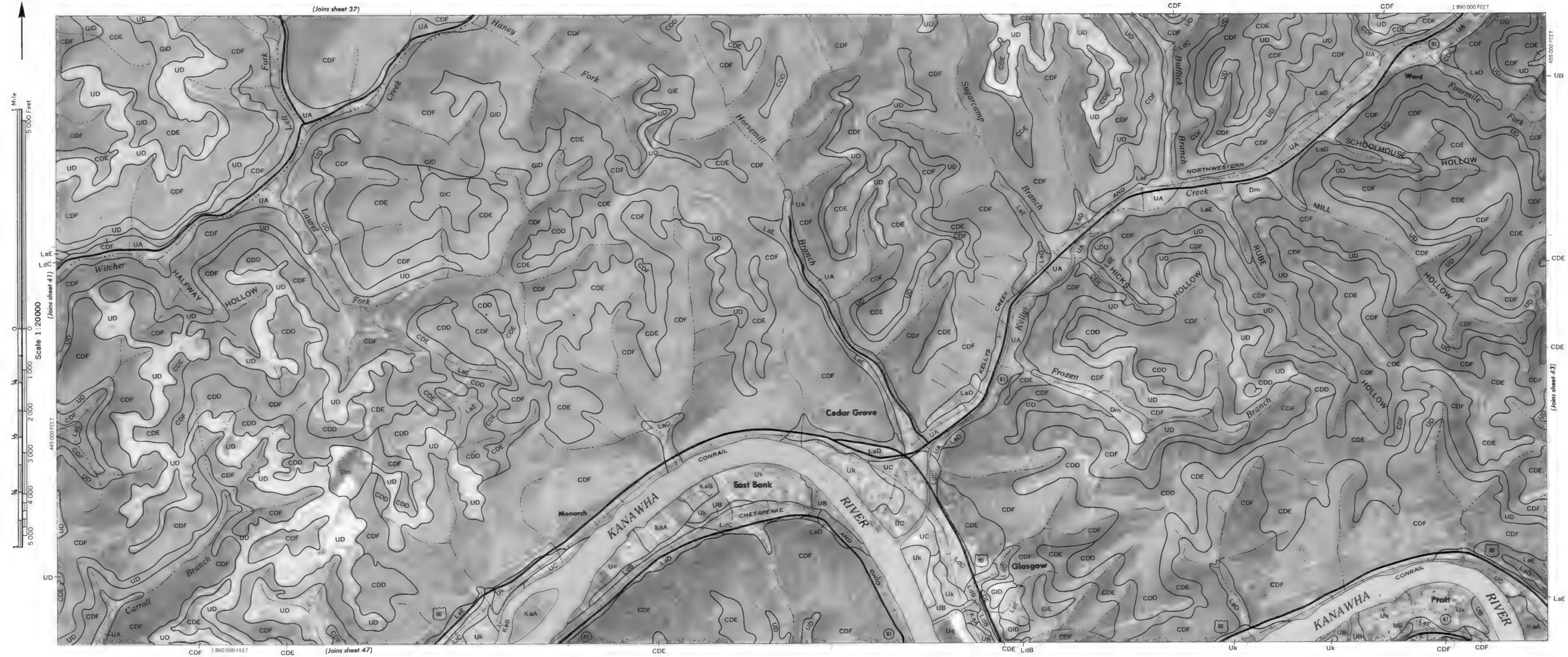
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 38

KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 39

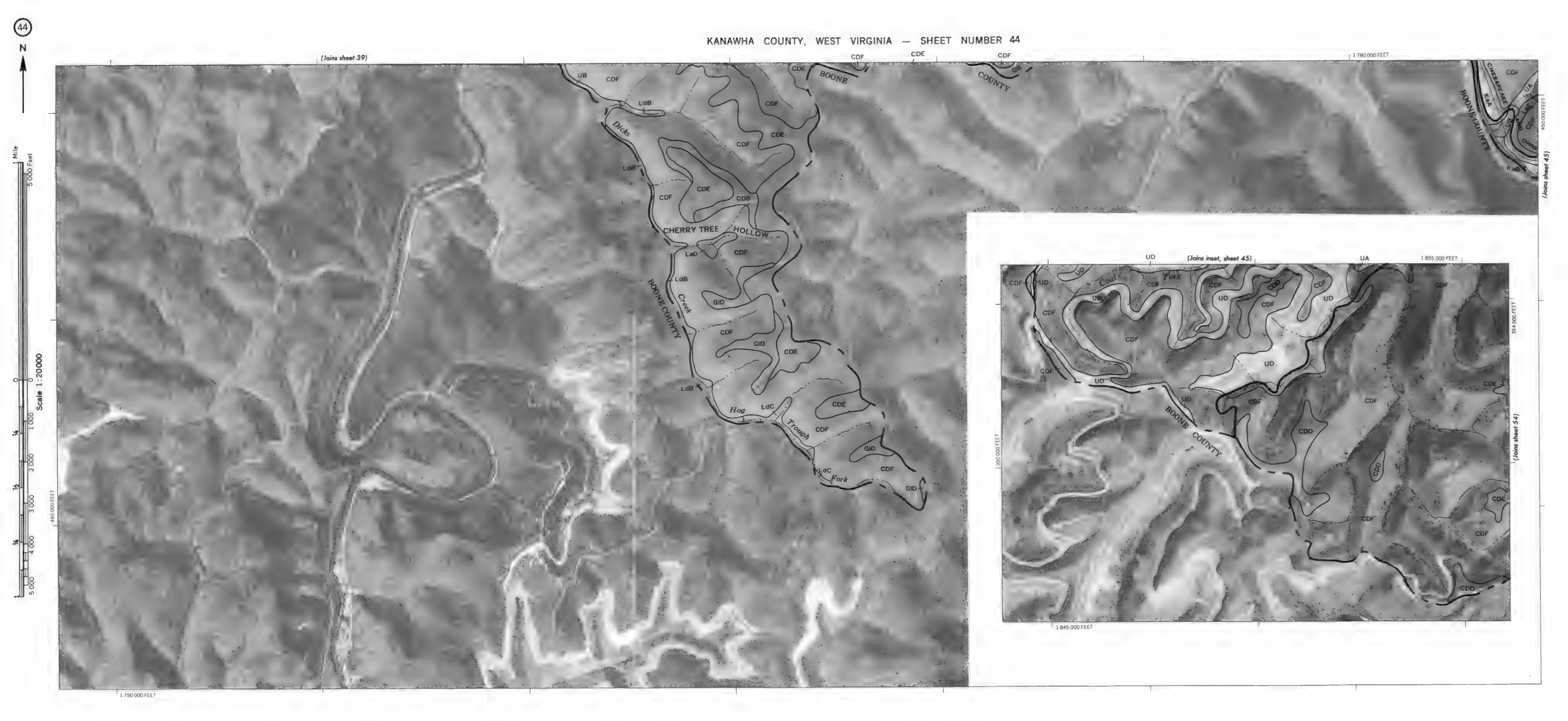


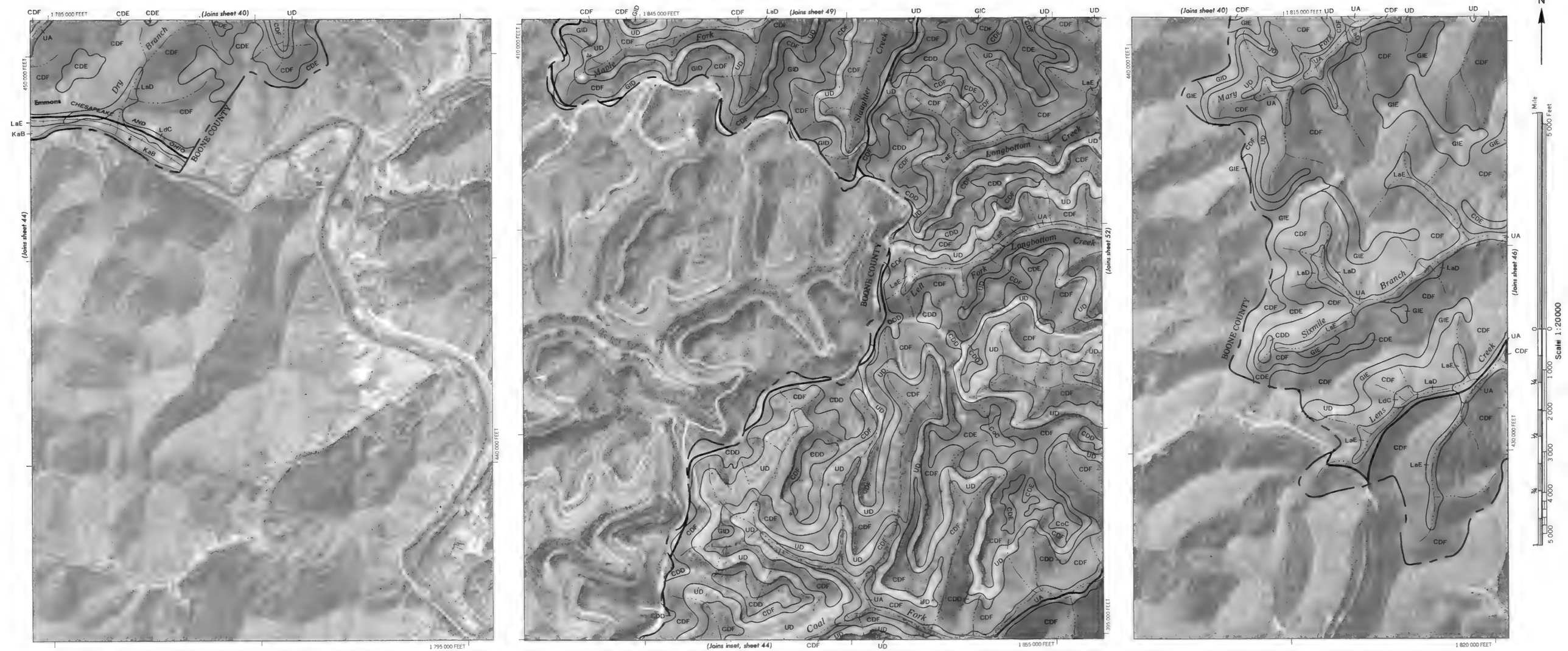

N
Scale 1:20000
Mile
5 000 Feet
1 000
2 000
3 000
4 000
5 000
1 785 000 FEET
1 820 000 FEET
455 000 FEET
(Joins sheet 35)
(Joins sheet 39)
(Joins sheet 41)
(Joins sheet 45)
Lico
Dungriff
Olcott
CONRAIL
Sugarcamp Fork
Meadow Fork
Spruce Fork
Brushy Fork
Brier Creek
Holstein Hollow
Sent Lick Branch
Lick Branch
Cane Branch
Finney Branch
Dunlop Hollow
Davis Creek
Hoffman Hollow
Fourmile Fork
Mary Fork
BOONE COUNTY

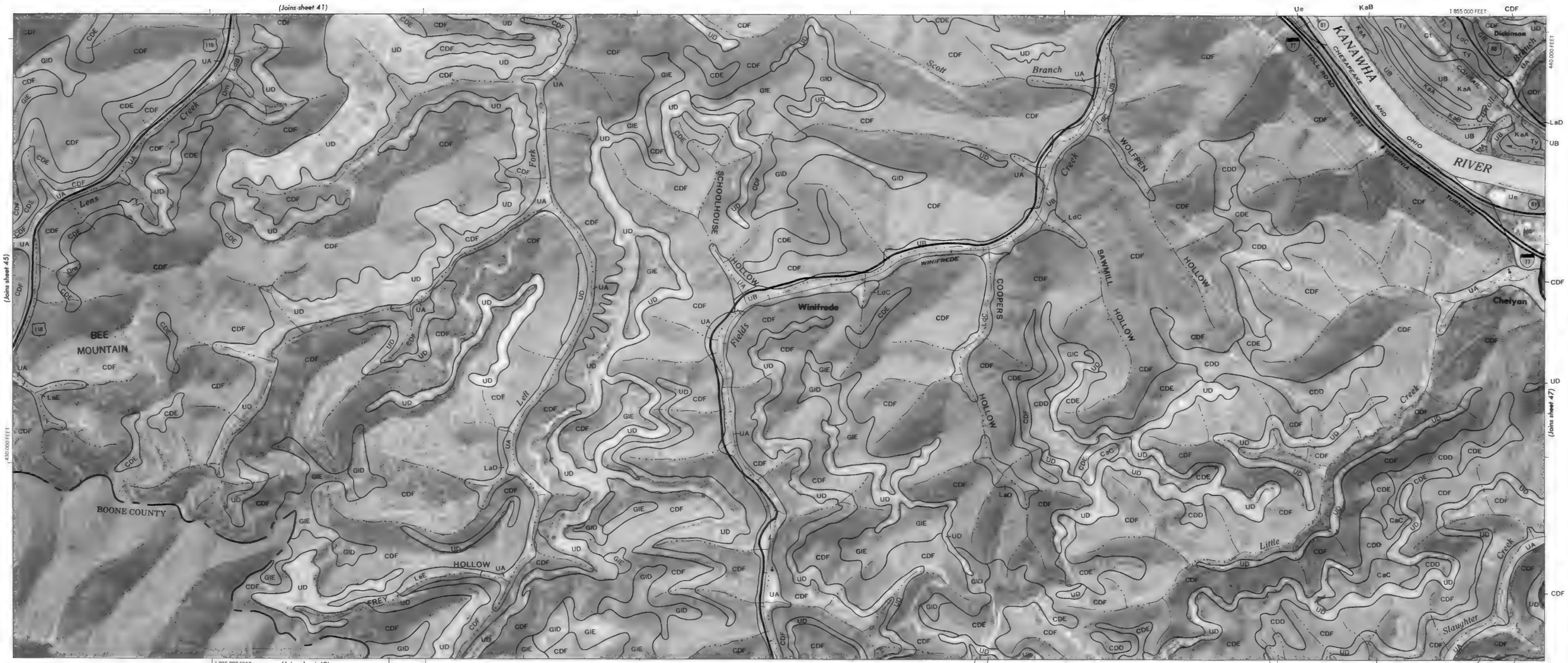

N
(Joins sheet 36)
(Joins sheet 40)
(Joins sheet 42)
(Joins sheet 46)
1 825 000 FEET
1 855 000 FEET
455 000 FEET
425 000 FEET
Lower Belle
Marmet
Belle
Hernshaw
Chesapeake
Witcher
Diamond
KANAWHA
RIVER
SCOTTS ISLAND
water
Middlelick Branch
RING HOLLOW
Fourmile Fork
Lens Creek
Left Fork
Spruce Fork
BRADFORD HOLLOW
Mill Branch
Fields Creek
Simmons Creek
Reynolds Branch
Dry Branch
Witcher Creek
TOLL ROAD
WEST VIRGINIA TURNPIKE
CONRAIL
WINIFREDE
Scale 1:20000
Mile
5 000 Feet

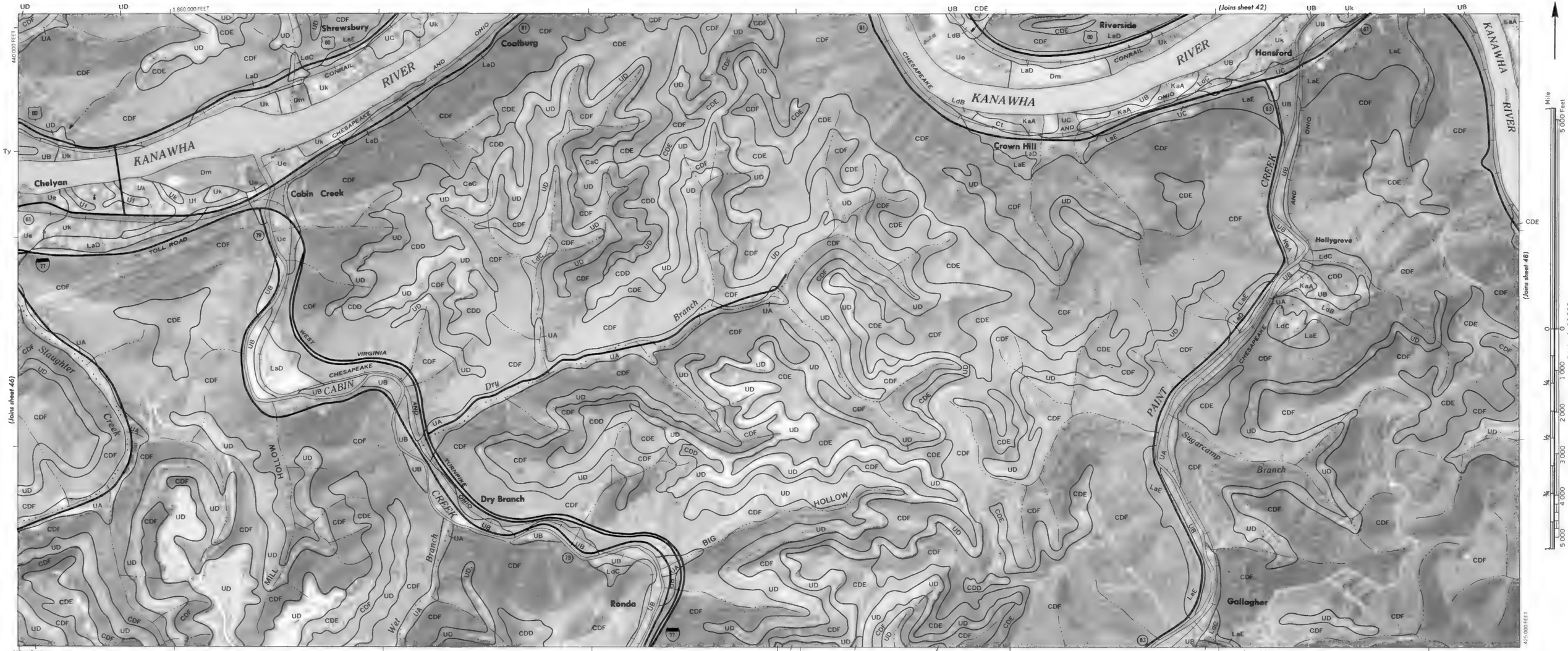

(42)
N
(Joins sheet 37)
1 890 000 FEET
455 000 FEET
Scale 1:20000
1 Mile
5 000 Feet
(Joins sheet 41)
(Joins sheet 43)
(Joins sheet 47)
1 860 000 FEET
Haney Fork
Left Fork Creek
Laurel Fork
Witcher Branch
HALFWAY HOLLOW
Horsemill Fork
Sugarcamp Branch
Bufflick Branch
Ward Fourmile Creek
SCHOOLHOUSE HOLLOW
NORTHWESTERN AND
MILL RUBE HOLLOW
HICKS HOLLOW
KELLYS CREEK
Frozen Branch
Cedar Grove
East Bank
Monarch
Glasgow
Pratt
CONRAIL
KANAWHA RIVER
CHESAPEAKE AND OHIO
Carroll Branch

KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 43

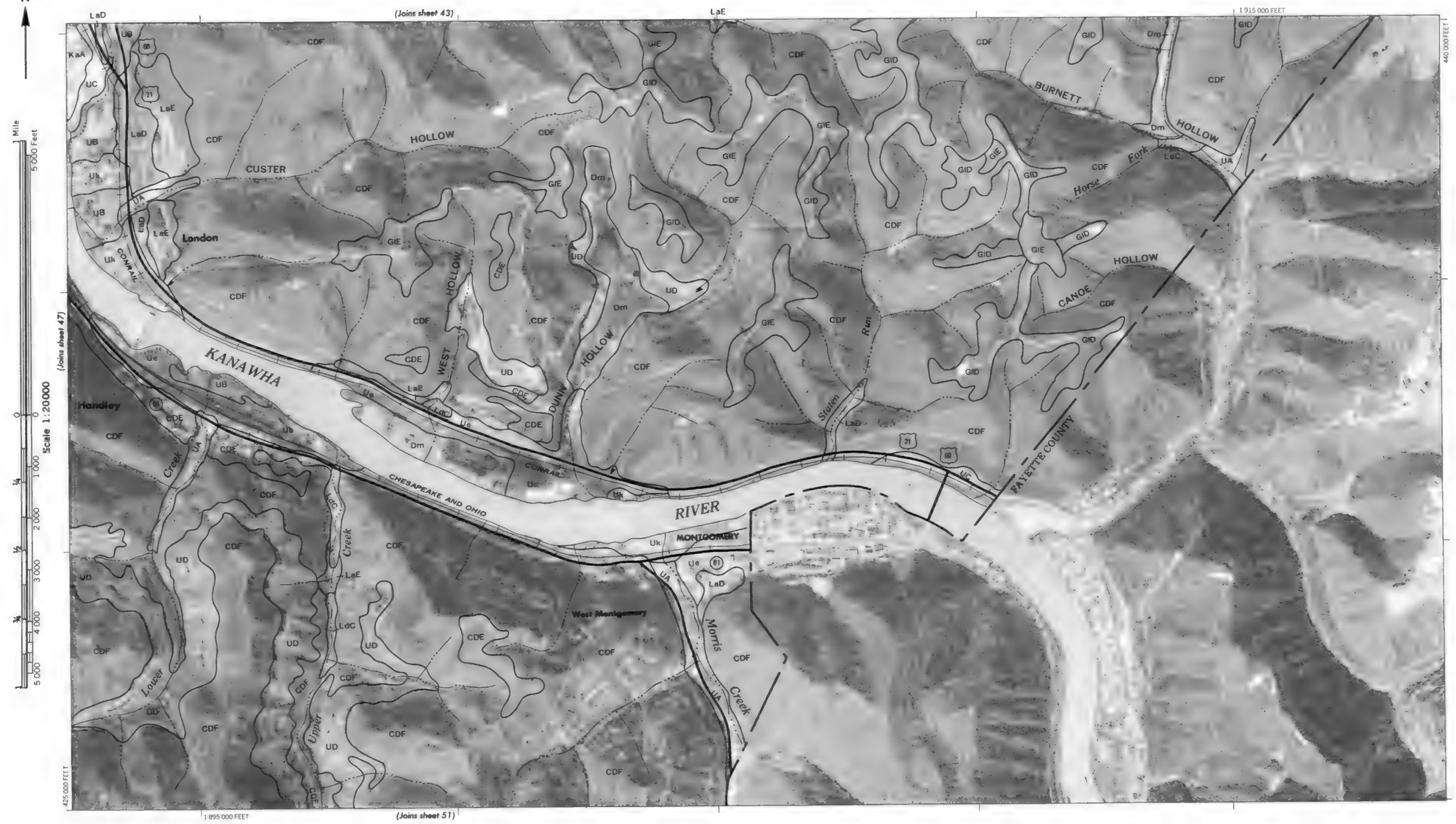

(44)
N
Scale 1:20000
1 Mile
5 000 Feet
(Joins sheet 39)
1 780 000 FEET
1 750 000 FEET
440 000 FEET
460 000 FEET
(Joins sheet 45)
BOONE COUNTY
CHERRY TREE HOLLOW
Dick
Creek
Hog
Trough
Fork
Coal
CHESAPEAKE
UB
LdB
LdC
LaD
GID
CDE
CDF
CDD
UD
UA
KeA
KaB
(Joins inset, sheet 45)
1 855 000 FEET
1 845 000 FEET
394 000 FEET
390 000 FEET
(Joins sheet 54)

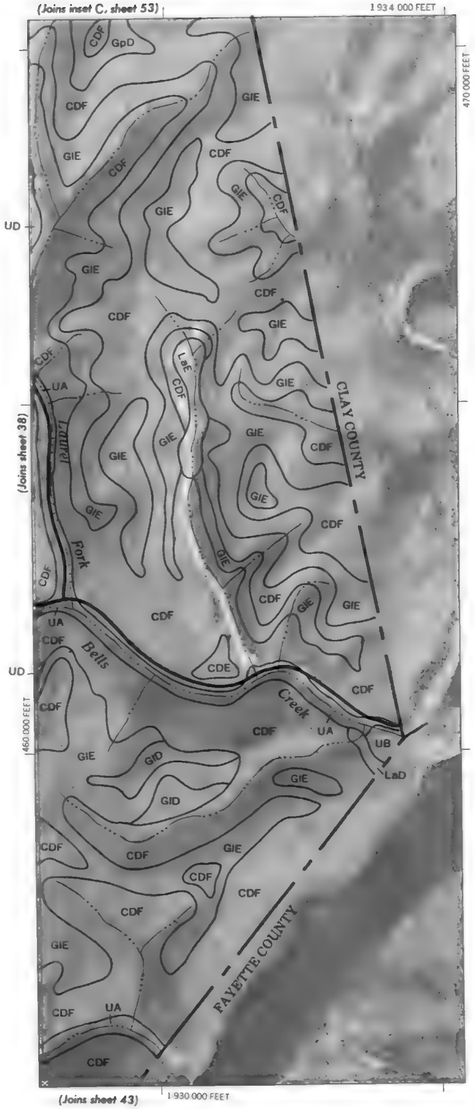

N
1 Mile
5 000 Feet
Scale 1:20000
1 785 000 FEET
1 795 000 FEET
1 845 000 FEET
1 855 000 FEET
1 815 000 FEET
1 820 000 FEET
450 000 FEET
440 000 FEET
430 000 FEET
410 000 FEET
395 000 FEET
(Joins sheet 40)
(Joins sheet 44)
(Joins sheet 49)
(Joins sheet 52)
(Joins sheet 46)
(Joins inset, sheet 44)
BOONE COUNTY
Dry Branch
Emmons
CHESAPEAKE AND OHIO
Manila Fork
Slaughter Creek
Longbottom Creek
Left Fork
Coal Fork
Mary Fork
Sixmile Creek
Lens Creek
CDF
CDE
CDD
UD
UA
GID
GIE
LaD
LaE
LdC
KaB
CoC


46
N
(Joins sheet 41)
(Joins sheet 45)
(Joins sheet 47)
(Joins sheet 49)
Scale 1:20000
1 Mile
5,000 Feet
1,000 0 1,000 2,000
3,000 4,000 5,000 FEET
1 825 000 FEET
1 855 000 FEET
440 000 FEET
430 000 FEET
KANAWHA
CHESAPEAKE AND OHIO RIVER
TOLL ROAD
WEST VIRGINIA TURNPIKE
BEE MOUNTAIN
BOONE COUNTY
Winifrede
Cheiyan
Dickinson
Branch
Scott
Lens
Creek
Left Fork
Fields
SCHOOLHOUSE HOLLOW
WINIFREDE
COOPERS HOLLOW
SAWMILL HOLLOW
WOLFPEN
HOLLOW
FREY
Little Slaughter Creek
Drn
LaB
LaD
LaE
LdC
CaC
GIC
GID
GIE
CDF
CDD
CDE
UA
UB
UD
KaA
KaB
Ty
Ue

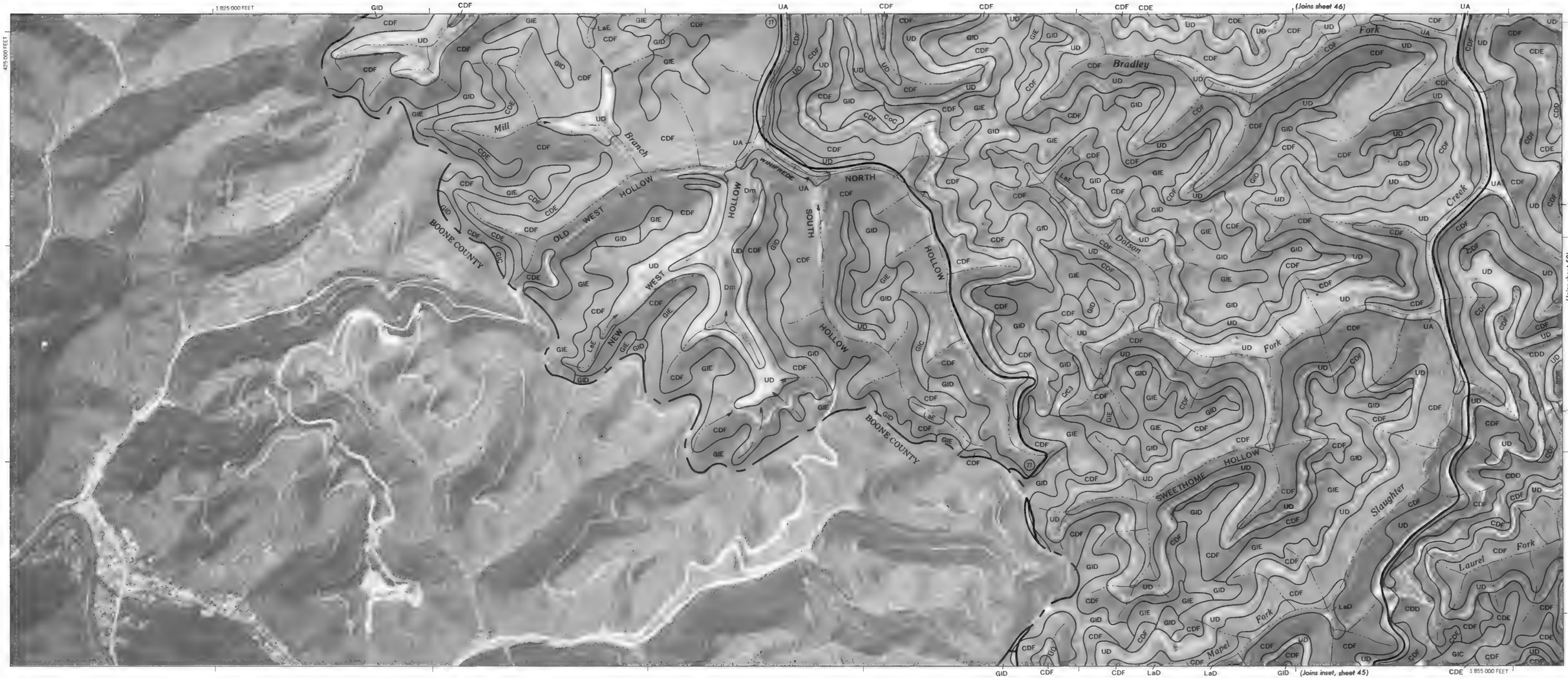

N
Scale 1:20000
Mile
5,000 Feet
1,860,000 FEET
1,890,000 FEET
440,000 FEET
425,000 FEET
(Joins sheet 42)
(Joins sheet 46)
(Joins sheet 48)
(Joins sheet 50)
Shrewsbury
Coalburg
Riverside
Hansford
Crown Hill
Chelyan
Cabin Creek
Hollygrove
Dry Branch
Ronda
Gallagher
KANAWHA RIVER
OHIO RIVER
CHESAPEAKE AND OHIO
CONRAIL
TOLL ROAD
WEST VIRGINIA TURNPIKE
Slaughter Creek
Dry Branch
Big Creek
Mill Creek
Paint Creek
Sugarcamp Branch
Hollow

KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 48

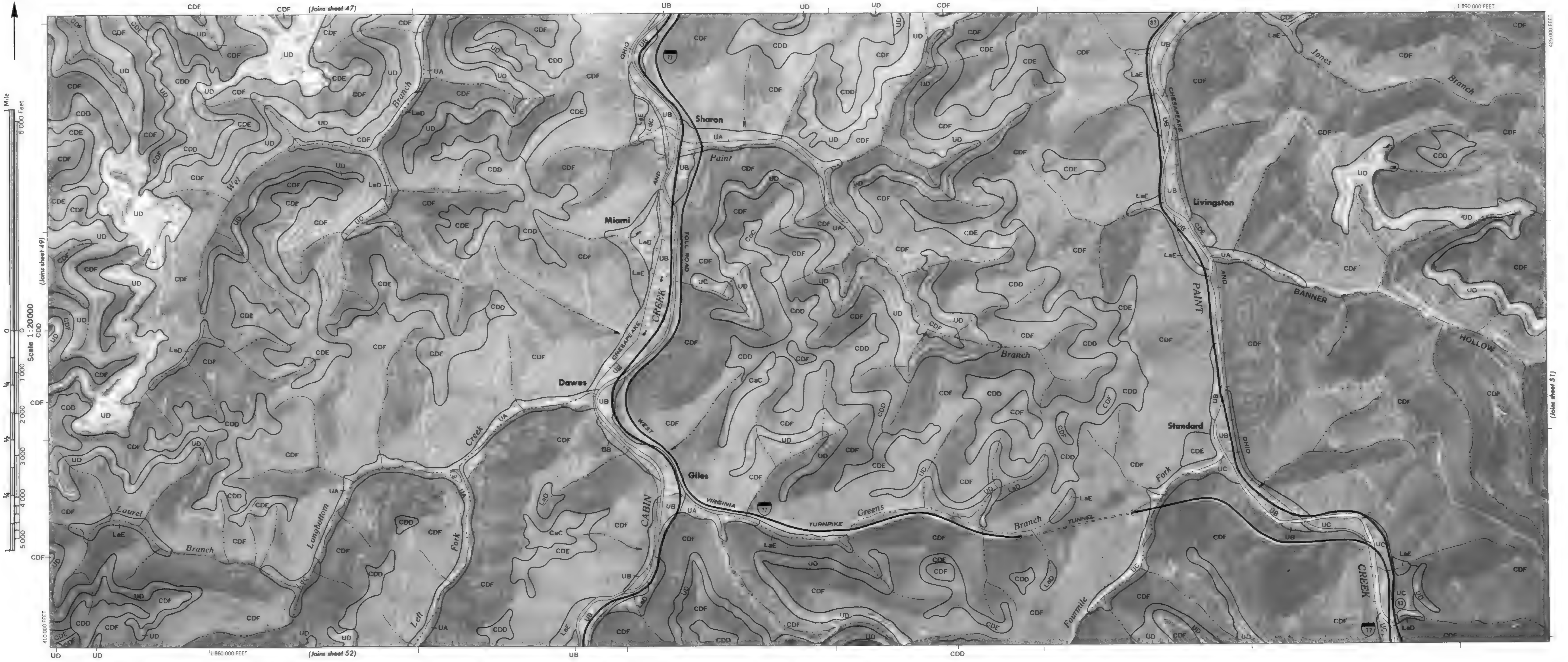




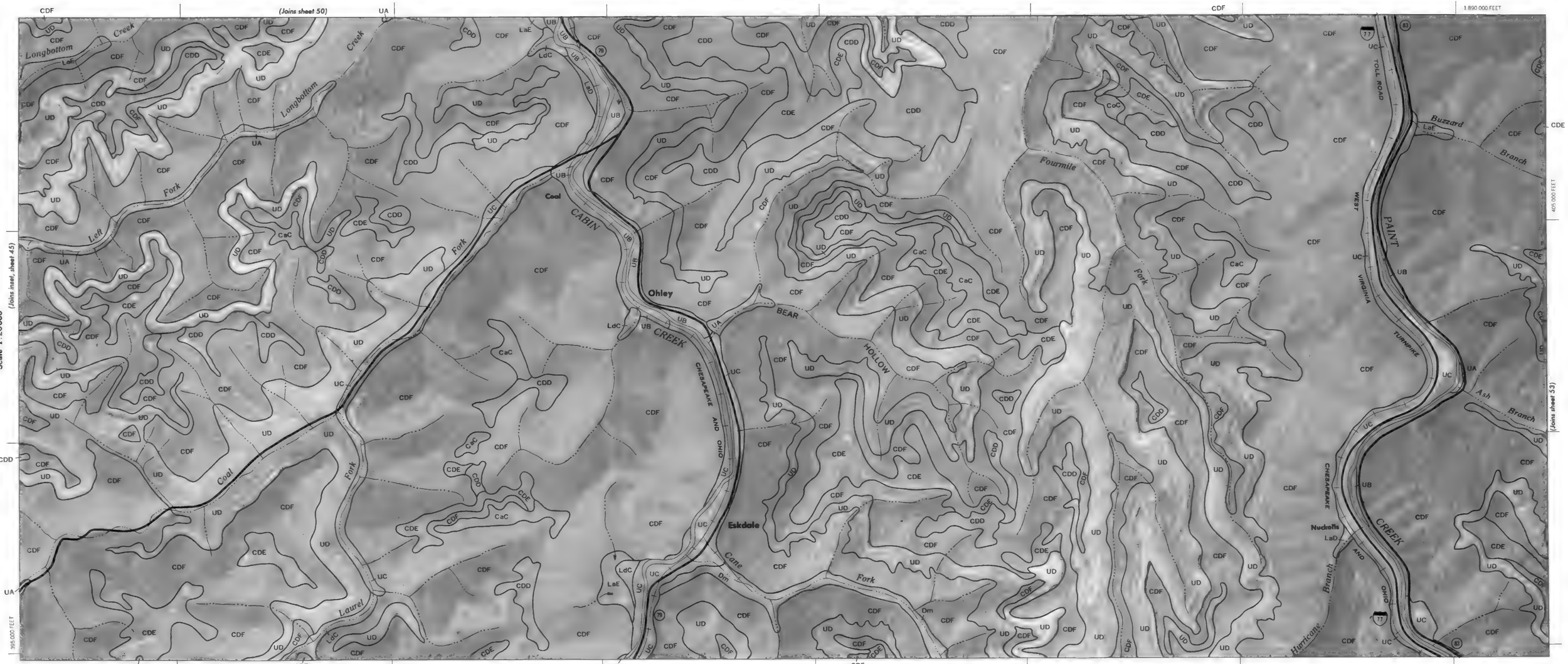
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 49



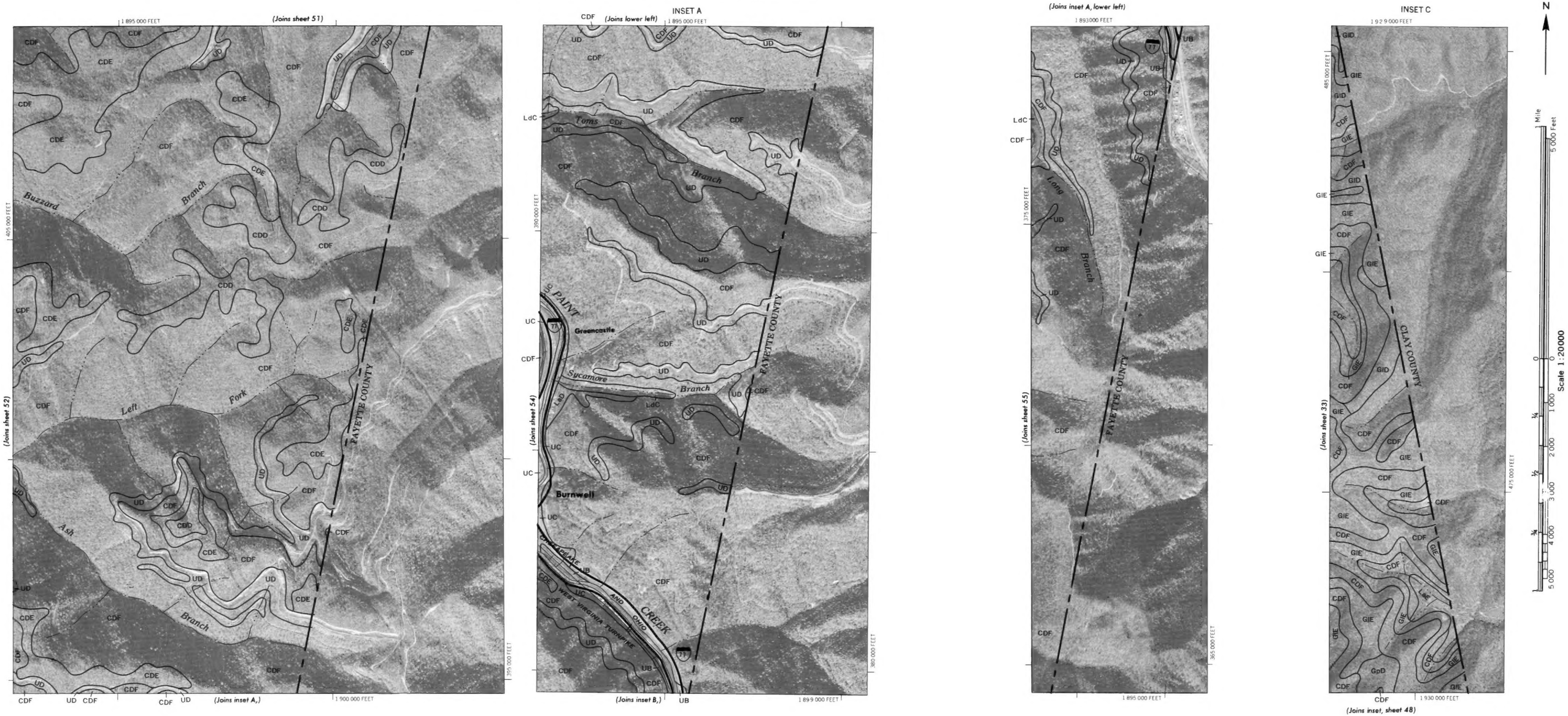
KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 50




1 895 000 FEET
(Joins sheet 48)
425 000 FEET
(Joins sheet 50)
(Joins sheet 53)
1 930 000 FEET
555 000 FEET
(Joins sheet 8)
550 000 FEET
(Joins inset, sheet 12)
1 945 000 FEET
1 925 000 FEET
415 000 FEET
ROANE COUNTY
CLAY COUNTY
FAYETTE COUNTY
Shoals Run
King
HOLLOW
BANNER
Creek
GIBSON
Young's
Branch
ELK RIVER
CHESAPEAKE AND OHIO
CDF
CDE
CDD
UD
GRE
GIE
GRF
GsD3
GID
GpD
GuD
VaC
KaA
KaB
KaB
UB
Dm
N
1 Mile
5 000 Feet
Scale 1:20000

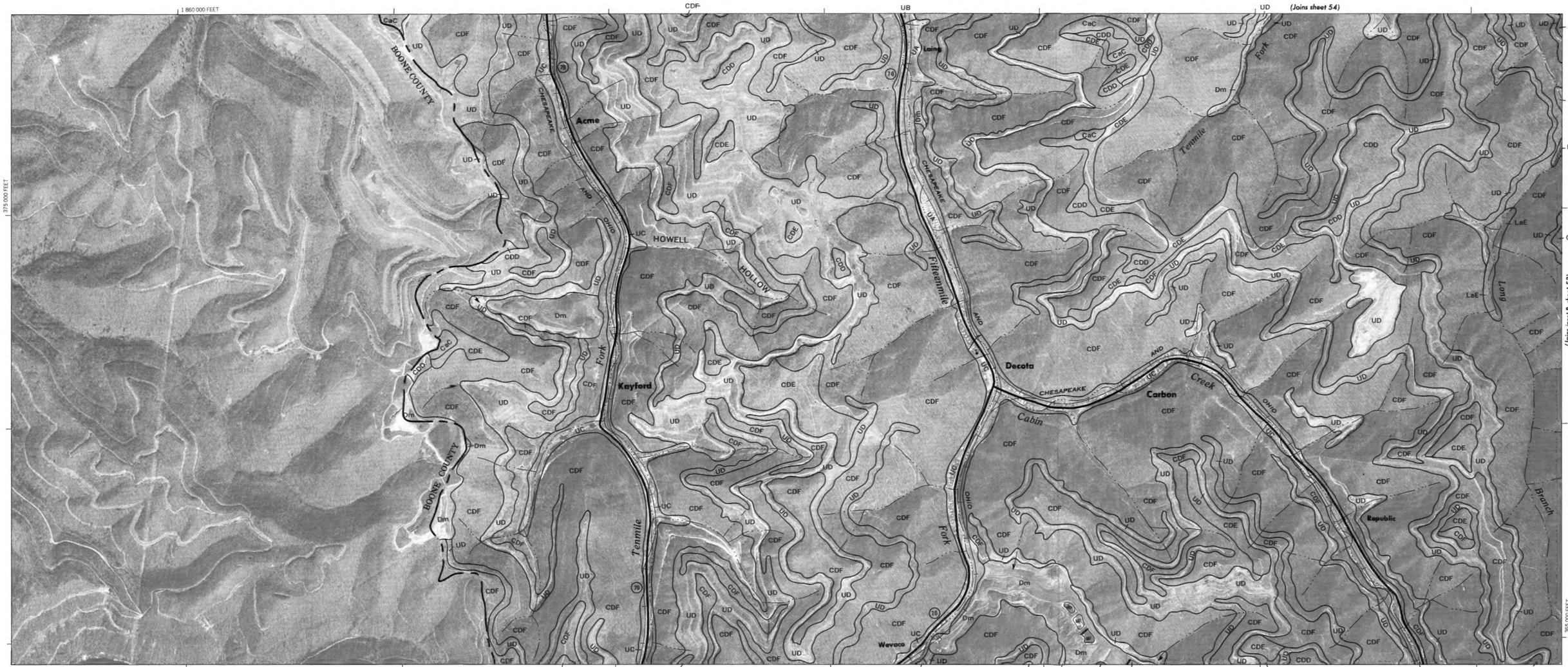

52
N
Scale 1:20000
Mile
5 000 Feet
(Joins inset, sheet 45)
(Joins sheet 50)
(Joins sheet 53)
(Joins sheet 54)
1 890 000 FEET
1 860 000 FEET
405 000 FEET
395 000 FEET
Longbottom Creek
Left Fork Coal
Fork Coal
Laurel Fork
Cane Fork
Fourmile Fork
Hurricane Branch
Buzzard Branch
Ash Branch
Coal CABIN CREEK
PAINT CREEK
BEAR HOLLOW
CHESAPEAKE AND OHIO
WEST VIRGINIA TURNPIKE
TOLL ROAD
Ohley
Eskdale
Nuckolls
CDF
CDD
CDE
UD
UC
UB
UA
LaE
LdC
LaD
CaC
Dm

KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 53



KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 54

KANAWHA COUNTY, WEST VIRGINIA — SHEET NUMBER 55




56
N
(Joins sheet 55)
1 890 000 FEET
360 000 FEET
350 000 FEET
1 860 000 FEET
Scale 1:20000
1 Mile
5 000 Feet
KAYFORD MOUNTAIN
BOONE COUNTY
RALEIGH COUNTY
FAYETTE COUNTY
Tenmile
Fork
United
Weyoca
Nebamine
Short
Long
Fifteenmile
Gibson
Branch
Creek
Cabin
Republic
Abbott
UD
CDD
CDF
CDE
UC
Dm